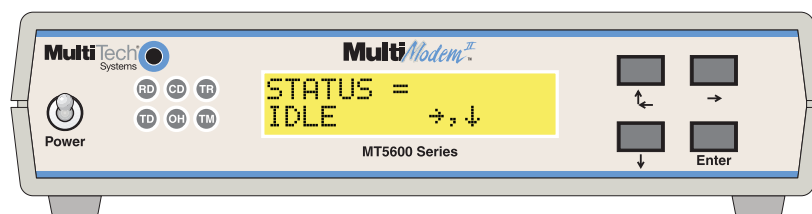

MultiModem^{II}



MT5600BA/BL Series

MT5600BA-V.92

MT5600BA-V.90

MT5600BL-V.90

Data/Fax Modem User Guide

MultiModemII User Guide

MT5600BA–V.92, MT5600BA–V.90, MT5600BL–V.90
P/N S000276C Revision C

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Record of Revisions

<i>Revision</i>	<i>Date</i>	<i>Description</i>
A	10/03/02	Initial release of MT5600BA Global V.92. (Also replaces S0000129 Rev. C - the MT5600BA/BL User Guide).
B	02/17/03	Changed cover. Changed text to indicate that the following are implemented: V.25bis HDLC NRZ?, V.25bis HDLC NRZI?, and V.25bis BISYNC
C	07/31/03	Added setting the country code using the LCD panel. Add country codes list.

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Patents

This device is covered by one or more of the following patents: 6,031,867; 6,012,113; 6,009,082; 5,905,794; 5,864,560; 5,815,567; 5,815,503; 5,812,534; 5,809,068; 5,790,532; 5,764,628; 5,764,627; 5,754,589; 5,724,356; 5,673,268; 5,673,257; 5,644,594; 5,628,030; 5,619,508; 5,617,423; 5,600,649; 5,592,586; 5,577,041; 5,574,725; 5,559,793; 5,546,448; 5,546,395; 5,535,204; 5,500,859; 5,471,470; 5,463,616; 5,453,986; 5,452,289; 5,450,425; D353,598; 5,355,365; 5,309,562; 5,301,274. Other patents pending.

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Chapter 1 - Description and Features

Congratulations on your purchase of the MultiModemII modem. You have acquired one of the finest intelligent data/fax modems available today from one of the world's oldest modem manufacturers: Multi-Tech Systems, Inc. This user guide will help you install, configure, test and use your modem.

Product Description

This modem supports two-wire and/or four-wire leased lines. The four-wire leased line includes the dial backup and automatic leased line restoration features. Please note that, because leased-line operation consists of two client modems connected to each other, the maximum leased line data rate is 33.6K bps.

The MT5600BA-V.92 modem supports both two-wire and four-wire leased lines.

The MT5600BA modem supports a two-wire leased line.

The MT5600BL modem supports a four-wire leased line.

The MultiModemII offers interactive automatic dialing. You can store four command lines or telephone numbers of up to 30 characters each in the modem's nonvolatile memory. The modem pulse- or tone-dials, and recognizes dial tones and busy signals for reliable call-progress detection. It can also detect AT&T calling card tones. It is FCC-registered for connection to telephone networks without notification to the telephone company.

The MultiModemII front panel includes a liquid crystal display and four buttons, which together can be used to either display the current connection status of the modem or to configure the modem. The MultiModemII also can be configured through standard AT commands.

About AT Commands

AT Commands for this product are published in a separate document and included on the MT5600BA/BL System CD that accompanies your modem.

Features

General

- Complies with major international standards to ensure compatibility with other modems.
- Uses DTMF and tone detection to distinguish data and fax calls when used with software that supports these features.
- Supports serial port speeds to 230.4K bps with compatible serial ports
- Supports Caller ID (North American versions only).
- Displays status and configuration information on a front panel LCD.

Data

- Supports automatic fallback to slower speeds in noisy line conditions, and fall-forward to faster speeds as conditions improve.
- Supports both synchronous and asynchronous data transfer.
- Support two-wire leased line operation. Also supports four-wire leased line operation with dial backup and leased line restoration.
- Supports callback security and remote configuration.
- Supports AS400 applications.
- Automatically disables compression when transferring already-compressed files.
- Can autodial, redial, pulse (rotary) and touch-tone dial.
- Detects dial tones and busy signals for reliable call-progress detection.
- Compatible with the standard AT command set used by most communication programs.
- Supports Plug and Play (PnP).
- Can be flash upgraded.

Fax

- Supports V.17, Class 1, and Group 3 fax standards, (V.92 support Class 2 also) allowing it to communicate with other fax modems as well as with fax machines.

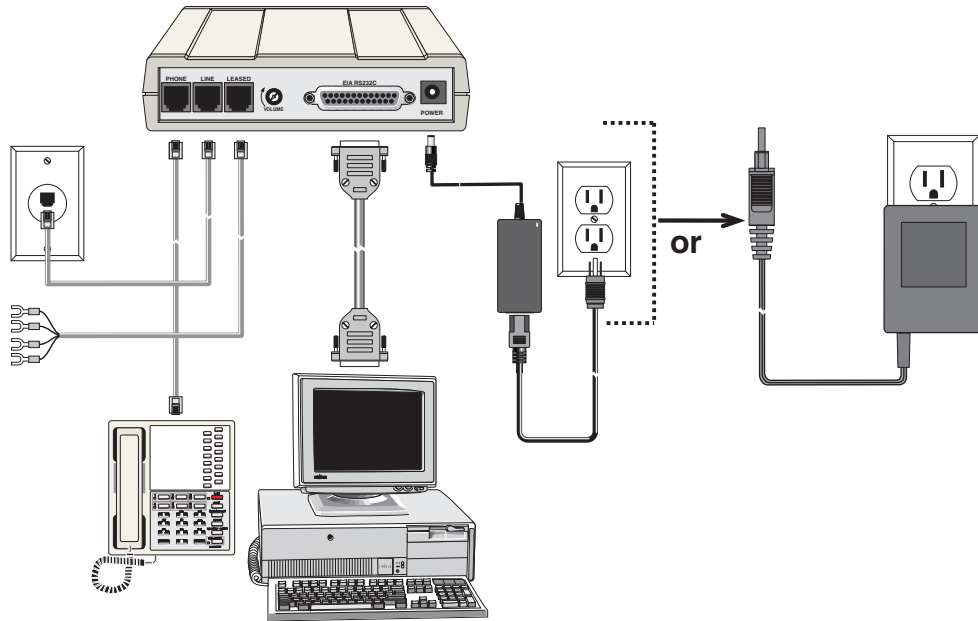
Safety Warnings

- Use this product only with UL- and CUL-listed computers.
- To reduce the risk of fire, use only 26 AWG or larger telephone wiring.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone during an electrical storm; there is a risk of electrical shock from lightning.
- Do not use a telephone in the vicinity of a gas leak.

Chapter 2 - Installation

Step 1 - Connect the Modem to Your System

Turn off your computer. Placing the modem in a convenient location, connect it to your computer's serial port, to the telephone line, to your leased line, to AC power, and, optionally, to your telephone.



MultiModemII connections with V.92 transformer and V.90 transformer.

Connect the Modem to Your PC

Plug one end of the serial cable into the RS-232 connector on the modem, and the other end into a serial port connector on your computer, such as COM1 or COM2.

Connect the Modem to the Telephone Line (Dialup Connection)

Plug one end of the modular phone cable into the modem's LINE jack, and the other end into a public switched telephone network (PSTN) wall jack.

Important: The LINE jack is not interchangeable with the PHONE jack. Do not plug the phone into the LINE jack or the line cable into the PHONE jack.

Note: Regulatory agencies may impose certain restrictions on equipment connected to public telephone systems.

Connect the Two-Wire Leased Line

MT5600BA – Plug one end of a two-wire phone cable into the modem's LINE jack; connect the other end to a leased line wall jack or terminals.

MT5600BL – Plug one end of a two-wire phone cable into the modem's LEASED jack; connect the other end to a leased line wall jack or terminals.

Connect the Four-Wire Leased Line

MT5600BL Only – Plug one end of a four-wire phone cable into the modem's LEASED jack; connect the other end to a four-wire leased line wall jack or terminals.

Modems with a leased-line jack support the dial backup feature. For dial backup operation, plug one end of your dialup modular phone cable into the modem's LINE jack and the other end into a PSTN wall jack. Plug one end of a two-wire or four-wire phone cable into the modem's LEASED jack, and connect the other end to a leased-line wall jack or terminals.

Modems with a leased-line jack support the dial backup feature. For dial backup operation, plug one end of your dialup modular phone cable into the modem's LINE jack and the other end into a PSTN wall jack.

Connect the Phone to the Modem (Optional)

For voice-only calls, plug a telephone into the modem's PHONE jack.

Connect the Modem to the AC Power Outlet

Plug the power transformer into an AC power outlet or power strip. Plug the power transformer's cable into the POWER jack on the modem.

Note: Use only the power transformer supplied with the modem. Use of any other transformer voids the warranty and can damage the modem.

Power-On Test

Test the modem by turning it on (a power switch is located on the front panel). When you apply power, the modem performs a diagnostic self-test, indicated by the TM indicator lighting for a few seconds, after which the LCD should light. If this does not happen, check that the power switch is on, the power transformer is solidly connected, and the AC outlet is live. If these measures do not work, see the "Troubleshooting" chapter.

Step 2 - Install the Modem Driver

If you use Windows 98/Me/NT 4.0/2000/XP; you must install the modem driver. The drivers are installed easily since Windows supports Plug-and-Play.

Installing the Modem Driver for Windows 98/Me/2000/XP

1. Make sure your modem is connected properly, and then turn on your computer. Windows should detect your new modem and open the **Install New Modem** wizard.
Note: If Windows cannot find a modem, your modem may be turned off, it may be plugged into the wrong connector on your computer, or the serial cable may be faulty. See “None of the LEDs Light When the Modem Is Turned On” and “The Modem Does Not Respond to Commands” in the “Troubleshooting” chapter.
2. Insert the MultiModemII system CD into your CD-ROM drive, and then click **OK**.
3. Windows installs and configures the modem.
4. Click **Finish** to exit.

Installing the Modem Driver for Windows NT

1. Make sure your modem is connected properly, and then turn on your computer. Windows should detect your new modem and open the **Install New Modem** wizard.
Note: If Windows cannot find a modem, your modem may be turned off, it may be plugged into the wrong connector on your computer, or the serial cable may be faulty. See “None of the LEDs Light When the Modem Is Turned On” and “The Modem Does Not Respond to Commands” in the Troubleshooting chapter of the User Guide.
2. In the **Install New Modem** wizard, select **Don't detect my modem; I will select it from a list**, and then click **Next**. A dialog box with a list of manufacturers and a list of modem models appears.
3. Insert the MultiModemII system CD into your CD-ROM drive, and then click **Have Disk**.
4. In the **Install from Disk** dialog box, select the drive that the CD is in, and then click **OK**.
5. A list of modems appears. Select your modem and click **Next**.
6. Select the port that the modem is connected to, and then click **Next**.
7. Windows installs and configures the modem.
8. Click **Finish** to exit.

Removing an Old Modem Driver

When your new modem replaces another modem, the old modem driver remains in Windows, and the old modem driver is still selected in HyperTerminal and other Windows applications. Though you can change the application connection descriptions one at a time, it is easier to force Windows applications to use the new modem by removing the old modem driver from Windows.

1. Click the **Start** button, point to **Settings**, and click **Control Panel**.
2. Double-click the Modems icon to open the **Modems Properties** dialog box.
3. In the list box, select the old modem.
4. Click **Remove**, and then click **Close**.
5. The next time you dial a HyperTerminal connection, it will select your new modem and ask you to confirm the selection.

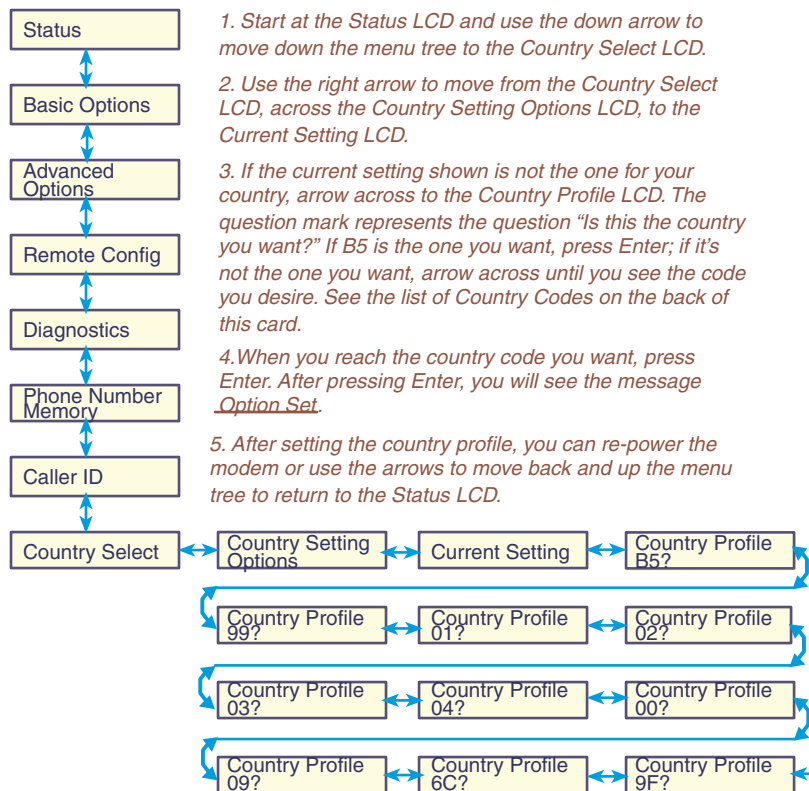
Step 3 - Setting Your Country Code (MT5600BA-V.92 Only)

The MT5600BA-V.92 modem is a global modem - it can be used all over the world.

Different countries have different requirements for how modems must function. Therefore, before you can use your modem, you must configure it to match the defaults of the country in which you are using it. You can use one of two configuration methods:

- Using the LCD Panel to Set Your Country Code
- Using the Global Wizard to Set Your Country Code
- Using AT Commands to Set Your Country Code

Using the LCD Panel



1. Start at the Status LCD and use the down arrow to move down the menu tree to the Country Select LCD.

2. Use the right arrow to move from the Country Select LCD, across the Country Setting Options LCD, to the Current Setting LCD.

3. If the current setting shown is not the one for your country, arrow across to the Country Profile LCD. The question mark represents the question "Is this the country you want?" If B5 is the one you want, press Enter; if it's not the one you want, arrow across until you see the code you desire. See the list of Country Codes on the back of this card.

4. When you reach the country code you want, press Enter. After pressing Enter, you will see the message Option Set.

5. After setting the country profile, you can re-power the modem or use the arrows to move back and up the menu tree to return to the Status LCD.

Country Codes

- **B5** – All countries use the Country Code **B5** except for the following codes.
- **99** – The following countries use the Country Code **99**:

Hong Kong	Israel,	Poland
Hungary	Korea (Democratic People's Republic of)	Slovenia
India	Korea (Republic of)	Vietnam
Indonesia	Philippines	
- **01** – Argentina
- **02** – Taiwan
- **03** – New Zealand
- **04** – Singapore
- **00** – Japan
- **09** – Australia
- **6C** – Malaysia
- **9F** – South Africa

Using the Global Wizard

The Global Wizard configuration utility is recommended for computers running in Windows. The Wizard can configure your modem for a specific country with just a few mouse clicks.

1. Insert the MultiModemII system CD into the CD-ROM drive. The **Autorun** dialog box appears.
2. Click **Initial Setup and Country Selection**. The Global Wizard dialog box appears. Click **Next**.
3. The Global Wizard searches for your modem and identifies it. Click **Next** after your modem is identified.
4. Select the country in which the modem will be used. Click **Next**.
5. Review your choice of country. If it is correct, click **Next** to configure the modem.
6. When the Global Wizard announces that the parameters have been set, click **Finish** to exit.

Using AT Commands

If you are comfortable using AT commands, you use them to configure your modem. You must enter these commands in your communication program's terminal window (a program such as PhoneTools). Execute the following AT commands:

Type **AT+GCI=nn** (*nn* stands for the country code). Press **Enter**.

OK displays.

Type **AT&F&W** to save your country code. Press **Enter**.

OK displays.

Type **ATI5** to verify your country code has been configured.

The country code is then displayed in hexadecimal format as in this example:

<u>Country</u>	<u>Hexadecimal Code</u>
Euro/NAM	B5

Note: See Multi-Tech's Web site for a list of country codes. Go to www.multitech.com.

Step 4 - Install PhoneTools

Note: PhoneTools may or may not be included on the MT5600BA/BL system CD according to your company's preference.

Data communications software gives you access to commands that govern how the modem operates; that is, how the modem handles incoming and outgoing data streams, etc.

MultiTech includes a data communications software package (PhoneTools) on the product CD shipped with your modem. In general, the modem will work with most data communications software packages.

1. Insert the MT5600BA/BL system CD into your CD-ROM drive. Allow Autorun to bring up the introductory screen.
2. Click on the PhoneTools icon and choose the appropriate country/language.
3. Follow the PhoneTools installation wizard. No input is needed. You may choose to view the "Readme" file and whether or not to run PhoneTools immediately.

Windows NT/2000/XP Note: During installation, an advisory screen may appear saying "FAX capture driver installation" - this may cause a delay in the installation. This is normal. The installation process has not failed or stalled. Simply wait a few moments until this screen disappears.

4. After installation, you can launch PhoneTools either from a desktop icon or from the **Start | Programs** menu. Typically, it's not necessary to reboot before using PhoneTools.

Chapter 3 - Using the Front Panel

Like any modem, your Multi-Tech modem operates only under the control of a communication program, such as the PhoneTools program included with the modem. It also operates under other general-purpose data communication programs, such as Windows Terminal and HyperTerminal. For information on how to use the modem with the communication program of your choice, please refer to the program's documentation.

Modem Configuration

Your modem normally is configured through Windows or through the communication program you are using. The default settings work best for most purposes. See "Step 4: Install PhoneTools" in Chapter 2 for help in setting up your communication program.

You also can configure your modem either through the front panel or by sending AT commands to the modem. The AT commands can be found in the AT Reference Guide on the CD shipped with this modem.

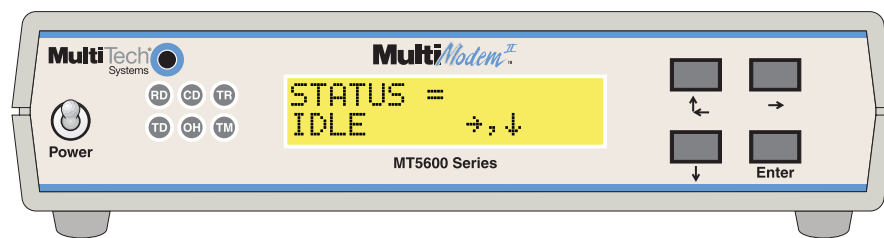


Figure 3-1. Front panel

LED Indicators

The MT5600BA-V.92 has six LED indicators on the front panel that indicate status and activity:

- RD** **Receive Data.** The **RD** indicator flashes when the modem is receiving data.
- TD** **Transmit Data.** The **TD** indicator flashes when the modem is transmitting data.
- CD** **Carrier Detect.** The **CD** indicator lights when the modem detects a valid carrier signal from another modem. It is on when the modem is communicating with the other modem, and off when the link is broken.
- OH** **Off-Hook.** The **OH** indicator lights when the modem is off-hook, which occurs when the modem is dialing, online, or answering a call. The LED flashes when the modem pulse-dials.
- TR** **Terminal Ready.** The **TR** indicator lights when a communication program is using the modem. It means the modem is ready for an outgoing or incoming call. It goes off when the communication program disconnects the serial port. When it goes off, a connected modem will disconnect.
- TM** **Test Mode.** The **TM** indicator lights when the modem is in test mode.

Liquid Crystal Display (LCD)

The MultiModemII's backlit liquid crystal display (LCD) has two functions: to display the current status of the modem and to display configuration menus, which are selected using the four pushbuttons on the front panel.

Option Selection

To select most configuration options, simply display the option in the LCD, and then press the **Enter** button to select it. An **OPTION SET** message appears to confirm the selection. To exit the **OPTION SET** message, press any button.

Some options, such as password options and phone number options, require you to enter a character string. To select a character, press the $\uparrow\leftarrow$ and \downarrow buttons. To go to the next character position, press the \rightarrow button. To backspace, press the \rightarrow button before selecting a character. To exit without saving, press the \rightarrow button several times. To save a character string, press the **Enter** button.

Menu Structure

The LCD menus have a tree structure with multiple trunks, limbs, branches, and twigs. For a schematic view, refer to the menu map on the next page.

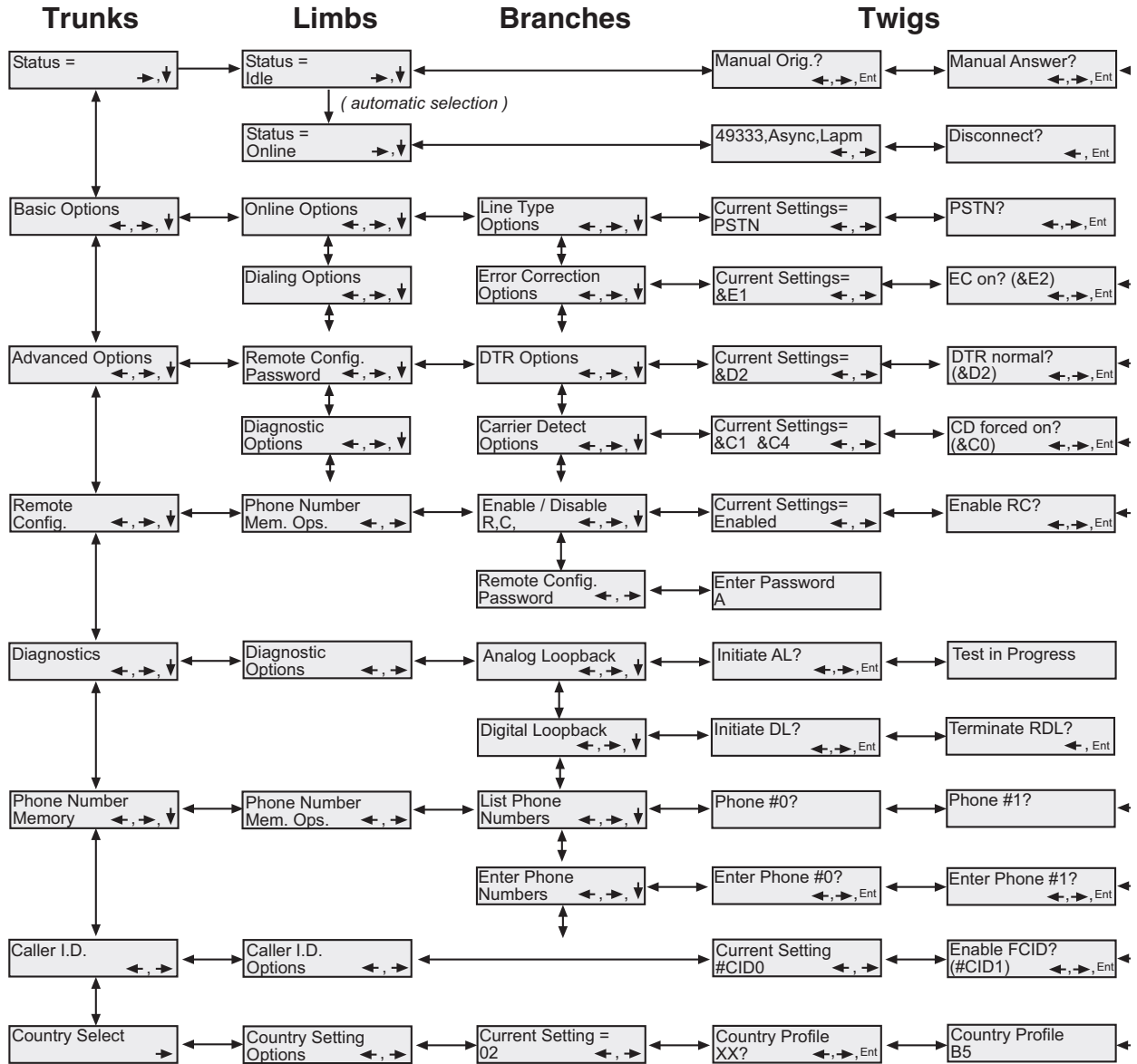
Trunks are the major divisions of the menu tree. There are seven trunks: Status, Basic Options, Advanced Options, Remote Configuration, Diagnostics, Phone Number Memory, and Caller ID. Use the $\uparrow\leftarrow$ and \downarrow buttons to move between trunks.

Limbs are subdivisions of trunks. Use the \rightarrow button to move from a trunk onto its first limb, and the $\uparrow\leftarrow$ and \downarrow buttons to move between limbs on the trunk.

Branches are subdivisions of limbs. Use the \rightarrow button to move from a limb onto its first branch, and the $\uparrow\leftarrow$ and \downarrow buttons to move between branches on the limb.

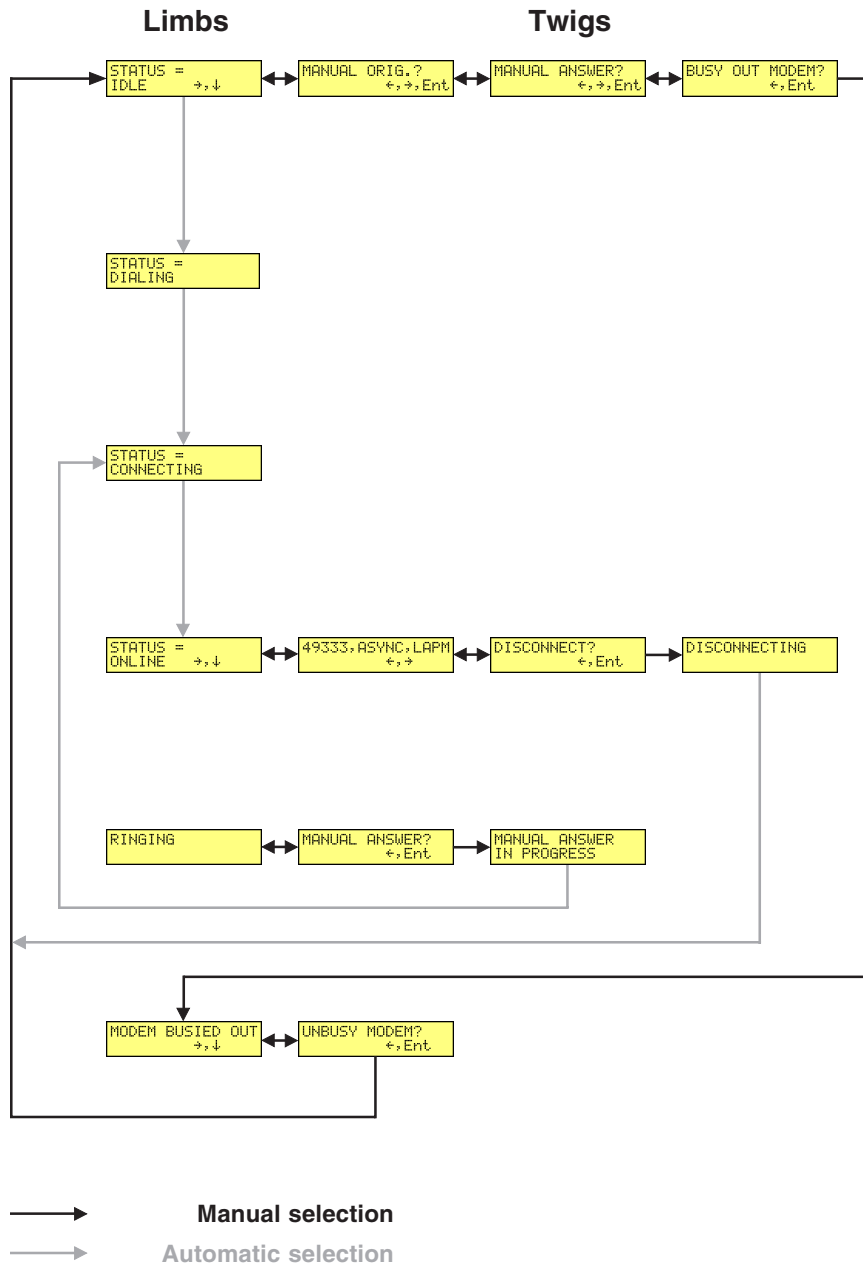
Twigs are status screens and options that are accessible only from branches. Use the \rightarrow button to move from a branch to its first status screen or option; then press the $\uparrow\leftarrow$ and \downarrow buttons to move between options, and press the **Enter** button to select an option.

Menu Overview



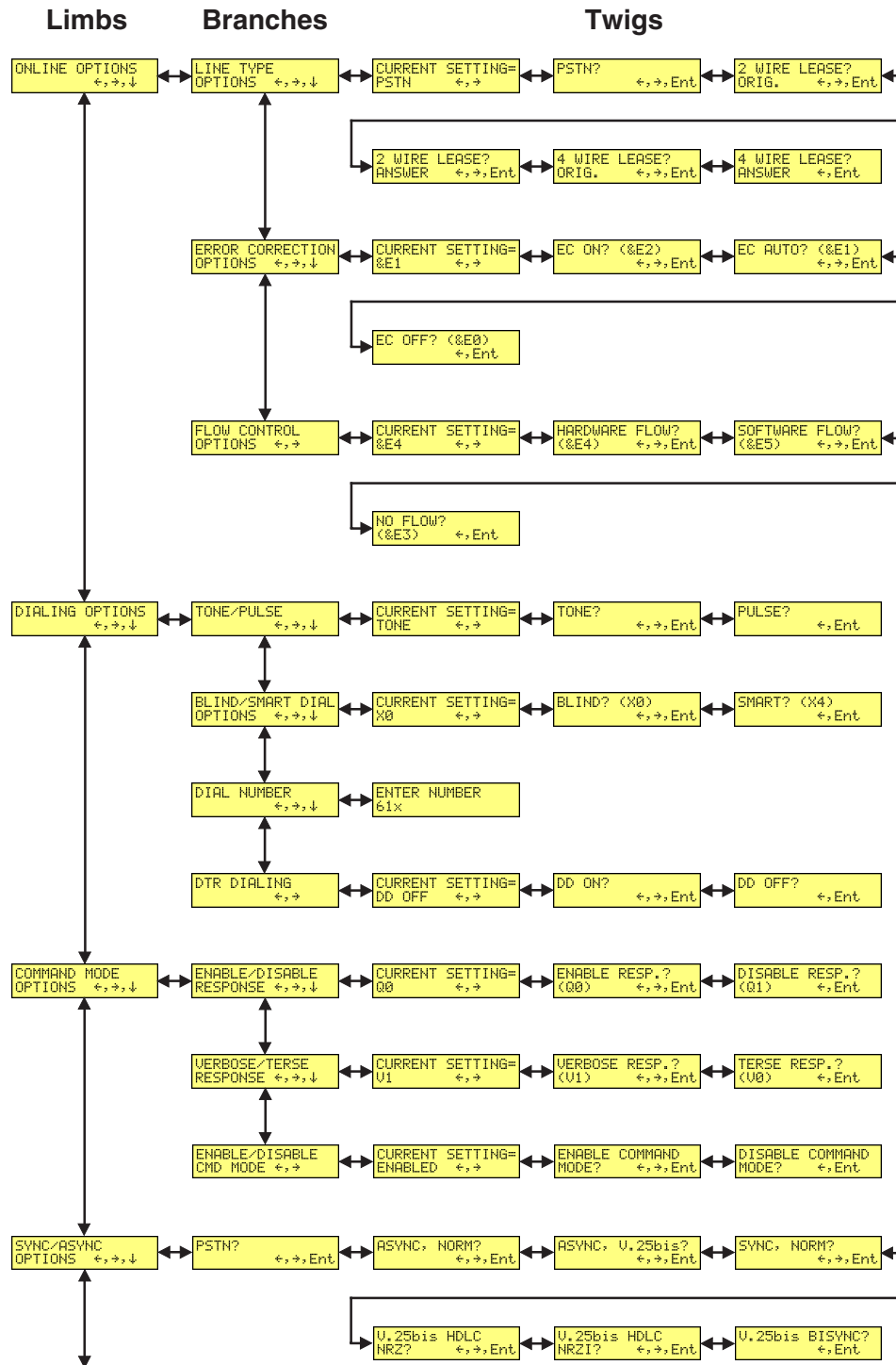
Status Trunk

The Status Trunk shows the current operating status of the modem. Limb changes are automatic, but certain options can be accessed by pressing the → button. Note that when the modem is online, pressing the → button shows the connect status, including the data speed, connection type, and compression type.



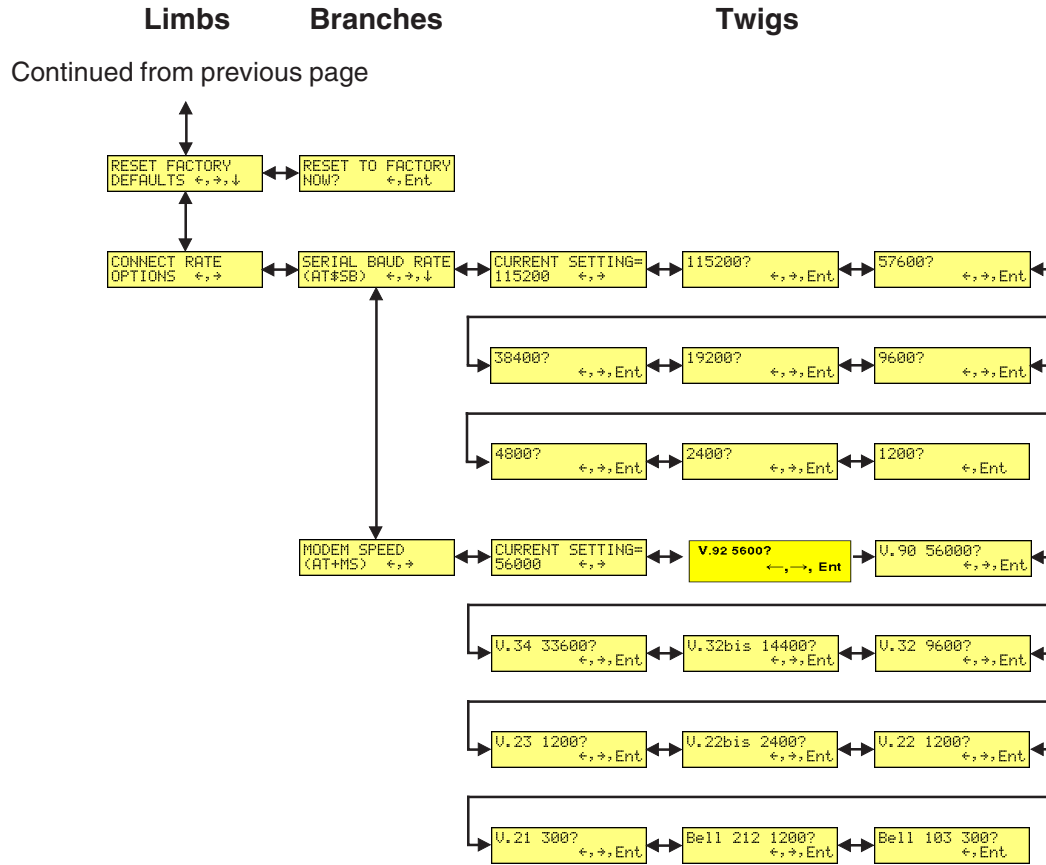
Basic Options Trunk

Use the Basic Options Trunk to configure the modem's basic operating conditions. When entering a number, use the $\uparrow\leftarrow$ and \downarrow buttons to scroll through a list of digits and characters. To go to the next position, press the \rightarrow button. To back up or to exit without dialing, press the \rightarrow button several times.



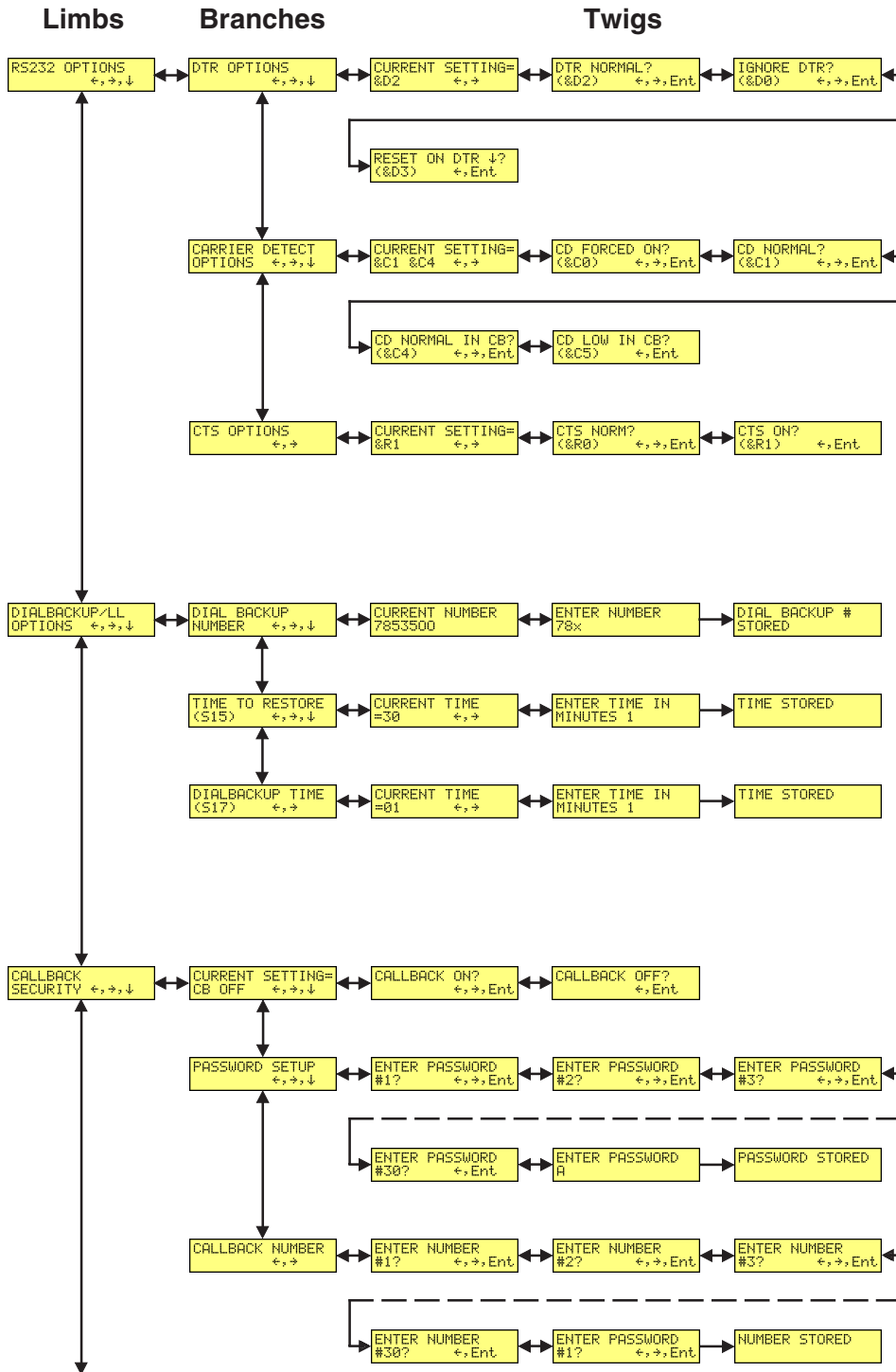
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Basic Options Trunk, continued



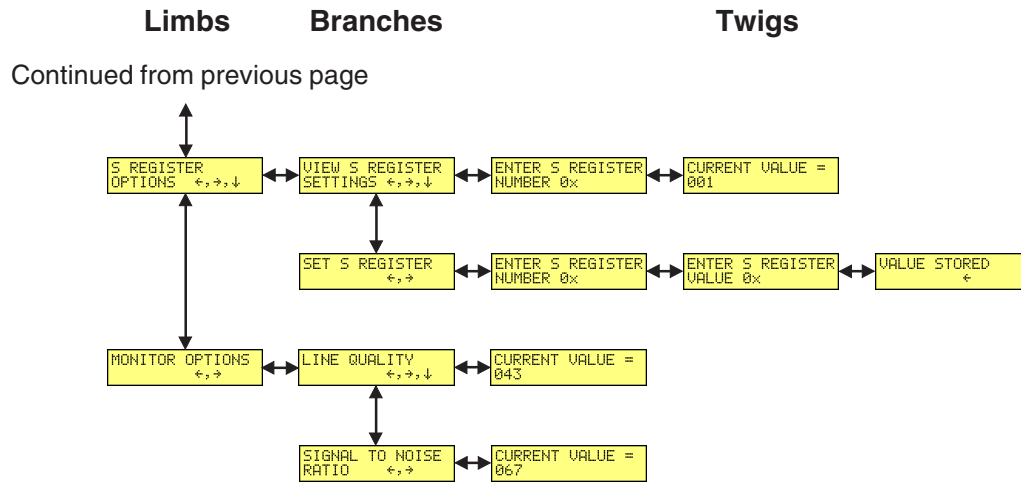
Advanced Options Trunk

Use the Advanced Options Trunk to configure RS-232, dial backup, and callback security options. When entering a number or password, use the \uparrow \leftarrow and \downarrow buttons to select a character or digit. To go to the next position, press the \rightarrow button. To backspace or to exit, press the \rightarrow button several times.



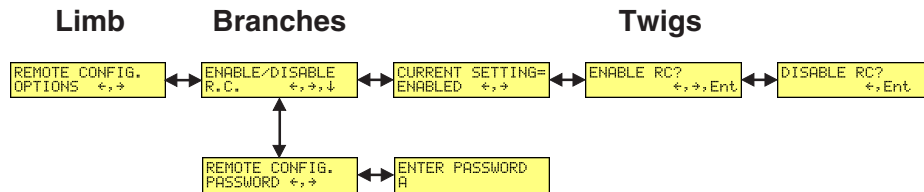
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Advanced Options Trunk, continued



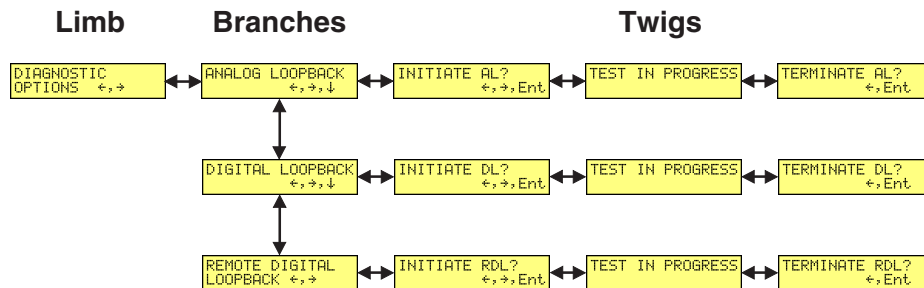
Remote Configuration Options Trunk

Use the Remote Configuration Options Trunk to enable or disable remote configuration on the modem, and to change the password. When entering the password, use the \uparrow \leftarrow and \downarrow buttons to scroll through the alphabet. To go to the next character position, press the \rightarrow button. To backspace or to exit, press the \rightarrow button several times.



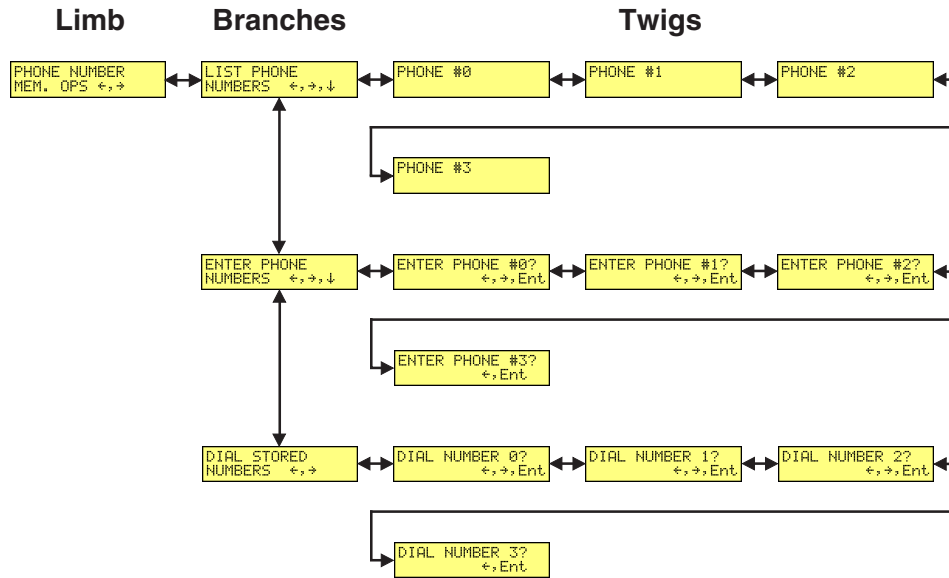
Diagnostic Options Trunk

Use the Diagnostic Options Trunk to run loopback tests on the modem. When a test is in progress, the TM indicator lights.



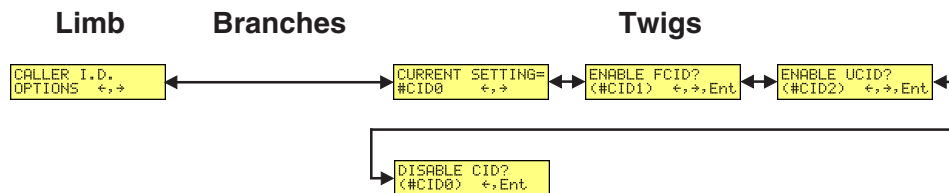
Phone Number Memory Options Trunk

The MultiModemII can store up to four telephone numbers for speed dialing. Use the Phone Number Memory Options Trunk to store, list, and dial these numbers. When entering a number, use the \uparrow \leftarrow and \downarrow buttons to scroll through the available digits and dialing commands. To go to the next position, press the \rightarrow button. To backspace or to exit, press the \rightarrow button several times.



Caller ID Options Trunk

Use the Caller ID Options Trunk to enable or disable Caller ID operation.



Menu Options

This section describes important LCD screens and options. Many, but by no means all, of the options have AT command equivalents.

Status

Status screens display the current status of the modem. Though limb changes are automatic, certain options can be selected by pressing the → button.

```
STATUS =
IDLE    →,↓
```

STATUS = IDLE. The modem is ready but inactive. This screen appears when the modem is first turned on, and is the starting point for accessing all other screens. Three options are available from this screen by pressing the → button:

```
MANUAL ORIG.?
←,→,Ent
```

MANUAL ORIG.? Places the modem in originate mode for the time specified by register **S7**. Use this option to connect to a remote modem by manually dialing the number on a phone connected to the local modem. When the remote modem answers, press the **Enter** button to establish a connection with the remote modem. You can also use this option to temporarily place the modem in originate mode for back-to-back testing.

```
MANUAL ANSWER?
←,→,Ent
```

MANUAL ANSWER? Places the modem in answer mode for the time specified by register **S7**. You can use this option to temporarily place the modem in answer mode for back-to-back testing.

```
BUSY OUT MODEM?
←,Ent
```

BUSY OUT MODEM? Takes the modem out of service by putting it into an off-hook state so that a calling modem receives a busy signal.

```
MODEM BUSIED OUT
→,↓
```

MODEM BUSIED OUT. Shows that the modem is busied out. To return the modem to normal service, press →, **Enter**.

```
STATUS =
ONLINE  →,↓
```

STATUS = ONLINE. The modem is connected to another modem. Two options are available from this screen by pressing the → button:

```
49333, ASYNC, LAPM
←,→
```

Connect Status. Shows the connect speed, connection type, and error correction being used.

```
DISCONNECT?
←,Ent
```

DISCONNECT? Press the **Enter** button to force the modem to hang up. Same as the **ATH** command.

```
RINGING
```

RINGING. A remote modem or caller is attempting to establish a connection. One option is available from this screen by pressing the → button:

```
MANUAL ANSWER?
←,Ent
```

MANUAL ANSWER? Forces the modem to answer the phone. You can use this option to establish a connection if autoanswer is turned off (**S0=0**). Same as the **ATA** command.

Basic Options

The following screens are used to configure the modem's basic operating conditions.

ONLINE OPTIONS
←, →, ↓

ONLINE OPTIONS. The following screens are used to configure the online operation of the modem:

LINE TYPE
OPTIONS ←, →, ↓

LINE TYPE OPTIONS. Use the → and **Enter** buttons to select from the following line types: dial-up (PSTN), two-wire leased line originate or answer, and four-wire leased line originate or answer.

ERROR CORRECTION
OPTIONS ←, →, ↓

ERROR CORRECTION OPTIONS. Use the → and **Enter** buttons to turn error correction on or off, or to select automatic error correction. Same as the **&E0**, **&E1**, and **&E2** commands.

FLOW CONTROL
OPTIONS ←, →

FLOW CONTROL OPTIONS. Use the → and **Enter** buttons to select no flow control, hardware flow control, or software flow control. Same as the **&E3**, **&E4**, and **&E5** commands.

DIALING OPTIONS
←, →, ↓

DIALING OPTIONS. The following screens are used to configure dialing options or to dial manually.

TONE/PULSE
←, →, ↓

TONE/PULSE. Use the → and **Enter** buttons to select between DTMF tone dialing and pulse dialing. Same as the **T** and **P** commands.

BLIND/SMART DIAL
OPTIONS ←, →, ↓

BLIND/SMART DIAL OPTIONS. Use the → and **Enter** buttons to select blind dialing, in which the modem sends the *OK*, *CONNECT*, *RING*, *NO CARRIER*, *ERROR* and *NO ANSWER* messages to the computer and does not look for a dial tone or busy signal, or smart dialing, in which the modem sends all messages to the computer, including *NO DIALTONE* and *BUSY*. Same as the **X0** and **X4** commands.

DIAL NUMBER
←, →, ↓

DIAL NUMBER. Use the front panel buttons to enter a phone number and dial it. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without dialing, press the → button several times. To dial the number, press the **Enter** button. Same as the **D** command.

DTR DIALING
←, →

DTR DIALING. Use the → and **Enter** buttons to enable or disable DTR dialing. DTR dialing is popular in synchronous applications. In DTR dialing, the modem automatically dials the number stored in memory location 0 when it detects a high DTR (Data Terminal Ready) signal on the RS-232 interface. The DTR signal must remain high for the duration of the call. To store the DTR dialing number, use the **&Z0=** command or the **ENTER PHONE #0** menu option.

Note: Plug and Play does not function if DTR dialing is enabled. DTR is used during Plug and Play, and DTR dialing interferes with it.

COMMAND MODE
OPTIONS ←,→,↓

COMMAND MODE OPTIONS. The following screens are used to configure result code responses.

ENABLE/DISABLE
RESPONSE ←,→,↓

ENABLE/DISABLE RESPONSE. Use the → and **Enter** buttons to enable or disable the sending of result codes to the computer. Same as the **Q0** and **Q1** commands.

VERBOSE/TERSE
RESPONSE ←,→,↓

VERBOSE/TERSE RESPONSE. Use the → and **Enter** buttons to select verbose or terse result codes. Same as the **V0** and **V1** commands.

ENABLE/DISABLE
CMD MODE ←,→

ENABLE/DISABLE CMD MODE. Use the → and **Enter** buttons to enable or disable the modem's ability to accept AT commands

SYNC/ASYNC
OPTIONS ←,→,↓

SYNC/ASYNC OPTIONS. Use the → and **Enter** buttons to select the method of data transmission.

ASYNC, NORM?
←,→,Ent

ASYNC, NORM? Normal asynchronous transmission using the AT command set.

ASYNC, V.25bis?
←,→,Ent

ASYNC, V.25bis? Asynchronous transmission using the V.25bis command set.

SYNC, NORM?
←,→,Ent

SYNC, NORM? Normal synchronous transmission using any command set.

V.25bis HDLC
NRZ? ←,→,Ent

V.25bis HDLC NRZ? V.25bis synchronous transmission using NRZ encoding.

V.25bis HDLC
NRZI? ←,→,Ent

V.25bis HDLC NRZI? V.25bis synchronous transmission using NRZI encoding.

V.25bis BISYNC?
←,Ent

V.25bis BISYNC? V.25bis bisynchronous transmission.

RESET FACTORY
DEFAULTS ←,→,↓

RESET FACTORY DEFAULTS. Use the → and **Enter** buttons to reset Profile 0 and the modem's active configuration to the factory defaults. Same as the **AT&F&W** command string.

CONNECT RATE
OPTIONS ←,→

CONNECT RATE OPTIONS. Use the → and **Enter** buttons to change the modem's serial port and data transmission speeds.

SERIAL BAUD RATE
(AT\$SB) ←,→,↓

SERIAL BAUD RATE. Use the → and **Enter** buttons to select the modem's serial port speed. The valid range is 1200 to 115200 bps. Same as the **\$SB** commands.

MODEM SPEED
(AT+MS) ←,→

MODEM SPEED. Use the → and **Enter** buttons to select the modulation protocol to use in originating or answering a connection. This also selects the maximum transmission speed at which the modem can operate. Same as the **+MS=[mod]** command.

Advanced Options

RS232 OPTIONS
←, →, ↓

RS232 OPTIONS. The following screens are used to configure the RS-232 interface.

DTR OPTIONS
←, →, ↓

DTR OPTIONS. Use the → and **Enter** buttons to select how the modem responds to the high to low transition of the DTR signal sent by the computer. **DTR NORMAL** causes the modem to hang up; **IGNORE DTR** allows operation with computers that do not provide DTR; and **RESET ON DTR** ↓ causes the modem to perform a soft reset as if the **Z** command were received. Same as the **&D0**, **&D2**, and **&D3** commands.

CARRIER DETECT
OPTIONS ←, →, ↓

CARRIER DETECT OPTIONS. Use the → and **Enter** buttons to select whether CD will be forced high (**CD FORCED ON**) or whether it will go high when the remote modem's carrier signal is detected, and go low when the carrier signal is not detected (**CD NORMAL**). Same as the **&C0** and **&C1** commands. When using callback security on UNIX systems, select **CD LOW IN CB** to force CD low until the proper callback security password has been entered or until a disconnect occurs. This prevents the UNIX login prompt from being displayed before the callback security **ENTER PASSWORD** prompt appears. Select **CD NORMAL IN CB** to disable this feature. Same as the **&C5** and **&C4** commands.

CTS OPTIONS
←, →

CTS OPTIONS. Use the → and **Enter** buttons to select whether the CTS state will follow the RTS state when on line (**CTS NORM**) or whether CTS will always be high (**CTS ON**). Same as the **&R0** and **&R1** commands.

DIALBACKUP/LL
OPTIONS ←, →, ↓

DIALBACKUP/LL OPTIONS. The following screens are used to configure dial backup for four-wire leased line operation. For more information, see Chapter 4, "Leased Line Operation."

DIAL BACKUP
NUMBER ←, →, ↓

DIAL BACKUP NUMBER. Use to enter a dial backup number. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the number, press the **Enter** button. Note: Only 16 characters can be displayed at a time. To see characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

TIME TO RESTORE
(S15) ←, →, ↓

TIME TO RESTORE (S15). Sets how frequently leased line restoral attempts occur when the modems are in dial backup mode. The restore time interval can be set from 10 to 255 minutes in one minute increments. A value of 0 disables dial backup. Same as the **S15=** command.

DIALBACKUP TIME
(S17) ←, →

DIALBACKUP TIME (S17). Use to set how long the modem waits after a leased line failure before it attempts a dial backup connection. The timer can be set from 1 to 255 minutes in one minute increments. Same as the **S17=** command.

CALLBACK
SECURITY ←, →, ↓

CALLBACK SECURITY. Use the → and **Enter** buttons to turn callback security on or off. Same as the **#DB0** and **#DB1** commands. For more information about callback security, see Chapter 6, “Callback Security.”

PASSWORD SETUP
←, →, ↓

PASSWORD SETUP. Use to enter callback security passwords in memory locations 1–30. Each password must be six to ten characters in length. To scroll through a list of digits and characters, press the ↑↵ and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the password, press the **Enter** button. Same as the **#CBP=** command.

CALLBACK NUMBER
←, →

CALLBACK NUMBER. Use to enter callback security phone numbers in memory locations 1–30. Each number can be up to 30 characters long. Same as the **#CBN=** command. Note: Only 16 characters can be displayed at a time. To see characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

S REGISTER
OPTIONS ←, →, ↓

S-REGISTER OPTIONS. Use the →, ↓, and **Enter** buttons to display the current S-register values and enter new values. Same as the **Sr?** and **Sr=n** commands.

VIEW S REGISTER
SETTINGS ←, →, ↓

VIEW S-REGISTER SETTINGS. Use the →, ↓, ↑↵, and **Enter** buttons to select the number of the S-register whose value you want displayed. To scroll through a list of digits, press the ↑↵ and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To display the value, press the **Enter** button. Same as the **Sr?** command.

SET S REGISTER
←, →

SET S-REGISTER. Use the →, ↓, ↑↵, and **Enter** buttons to select the number of the S-register whose value you want to change, and the value you want to enter. To scroll through a list of digits, press the ↑↵ and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. Same as the **Sr=n** command.

MONITOR OPTIONS
←, →

MONITOR OPTIONS. Use the →, ↓, and **Enter** buttons to display line quality and the line signal-to-noise ratio.

LINE QUALITY
←, →, ↓

LINE QUALITY. Use the → and **Enter** buttons to display line signal quality as a three-digit number. The higher order byte of the EQM value is displayed. Based on the EQM value, retrain or fallback/fall forward may be initiated if enabled by **%E1** or **%E2**. Same as the **%Q** command.

SIGNAL TO NOISE
RATIO ←, →

SIGNAL TO NOISE RATIO. Use the → and **Enter** buttons to display the line signal-to-noise ratio in dB.

Remote Configuration Options

REMOTE CONFIG.
OPTIONS ←,→

The following screens are used to configure remote configuration options. For more information about remote configuration, see Chapter 5, “Remote Configuration.”

ENABLE/DISABLE
R.C. ←,→,↓

ENABLE/DISABLE R.C. Use the → and **Enter** buttons to turn remoteconfiguration on or off.

REMOTE CONFIG.
PASSWORD ←,→

REMOTE CONFIG. PASSWORD. Use to enter the remote configuration password. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the password, press the **Enter** button.

Diagnostic Options

DIAGNOSTIC
OPTIONS ←,→

Use the following screens to turn loopback tests on and off. For information about how to apply these tests, see Appendix C, “Loopback Tests.”

ANALOG LOOPBACK
←,→,↓

ANALOG LOOPBACK. Press the → and **Enter** buttons to start the analog loopback test. The **TEST IN PROGRESS** screen appears. To stop the test, press the → and **Enter** buttons again.

DIGITAL LOOPBACK
←,→,↓

DIGITAL LOOPBACK. Press the → and **Enter** buttons to start the local digital loopback test. The **TEST IN PROGRESS** screen appears. To stop the test, press the → and **Enter** buttons again. Same as the **&T3** command.

REMOTE DIGITAL
LOOPBACK ←,→

REMOTE DIGITAL LOOPBACK. Press the → and **Enter** buttons to start the remote digital loopback test. The **TEST IN PROGRESS** screen appears. To stop the test, press the → and **Enter** buttons again. Same as the **&T6** command.

Phone Number Memory Options

PHONE NUMBER
MEM. OPS ←,→

Use the following screens to list, enter, and dial stored phone numbers. Up to four phone numbers can be stored. The number in memory location 0 is used for DTR dialing, if DTR dialing is enabled. Note: Only 16 characters can be displayed at a time. To display characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

LIST PHONE
NUMBERS ←,→,↓

LIST PHONE NUMBERS. Press the → button several times to display the phone number stored in each memory location.

ENTER PHONE
NUMBERS ←,→,↓

ENTER PHONE NUMBERS. Use to store up to four phone numbers in memory locations 0–3. Each number can have up to 30 characters. To scroll through a list of digits and characters, press the ↑← and ↓ buttons. To go to the next position, press the → button. To back up or to exit without saving, press the → button several times. To save the number, press the **Enter** button. Same as the **&Z=** commands.

DIAL STORED
NUMBERS ←,→

DIAL STORED NUMBERS. Press the → and **Enter** buttons to dial a stored phone number. Same as the **DS=** commands.

Caller ID Options

CALLER I.D.
OPTIONS ←,→

Press the → and **Enter** buttons to enable formatted (**FCID**) or unformatted (**UCID**) Caller ID, or to disable Caller ID altogether. Same as the **#CID=0**, **#CID=1**, and **#CID=2** commands.

Note: Because Caller ID information is sent between the first and second ring, register **S0** must be set to 2 or more rings for the modem to receive Caller ID information.

Chapter 4 - Leased Line Operation

This chapter describes how to use the MultiModemII modem on a leased line.

A leased line is a private, permanent, telephone connection between two points. Unlike normal dialup connections, a leased line is always active. The modems automatically connect when they are attached to the line and are turned on. Because a leased line is always active, one of the two modems on the line must be configured as the originate modem and the other as the answer modem; however, it does not matter which is which.

In the event of an interruption, leased line modems automatically reconnect when the data line or power is restored. The modem also supports dial backup, which enables the modem to automatically switch to a dial-up connection if the leased line goes down.

The modem supports both two-wire and four-wire leased-line operation.

Two-Wire Setup

1. For two-wire leased line operation on the MT5600BA modem, connect the provided modular telephone cable to the LINE jack. For two-wire leased line operation on the MT5600BL modem, connect the provided modular telephone cable to the LEASED jack. Connect the other end of the cable to the two-wire leased line jack or terminals supplied by the telephone company.

2. Turn on the modem.

```
CURRENT SETTING=
ASYNC AT ←,→
```

3. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, →, ↓, ↓, ↓, →. The **CURRENT SETTING=** screen appears.

```
SYNC, NORM?
←,→,Ent
```

4. If the **CURRENT SETTING=** screen shows **ASYNC AT**, press ↑← and go to step 7. If it shows anything else, press → to go to the **ASYNC, NORM?** screen.

5. Press the **Enter** button to select normal asynchronous operation.

```
OPTION SET
←,→
```

6. The **OPTION SET** screen appears. Press ↑← to exit to the **SYNC/ASYNC OPTIONS** screen.

```
2 WIRE LEASE?
ORIG. ←,→,Ent
```

7. Press ↑←, ↑←, ↑←, →, →, →, →. The **2 WIRE LEASE? ORIG** screen appears.

8. Choose one of two actions:

- To set up the modem as the originate modem, press the **Enter** button.
- To set up the modem as the answer modem, press → to display the **2 WIRE LEASE? ANSWER** screen, and then press the **Enter** button.

```
2 WIRE LEASE?
ANSWER ←,→,Ent
```

Note: One of the modems in a leased line pair must be configured as the originate modem, and the other as the answer modem, but it does not matter which is which.

```
OPTION SET
←,→
```

9. The **OPTION SET** screen appears. Press ↑← to exit to the **ONLINE OPTIONS** screen, or → to exit to the **CURRENT SETTING=** screen to verify the selection.
10. This completes the setup for two-wire leased line operation. Upon completion, the modem attempts to connect to the modem at the other end of the leased line. If the remote modem has not yet been configured for leased line operation, you may turn off the local modem until the remote one is ready.

Four-Wire Setup

1. For four-wire leased line operation, connect one of the provided four-wire cables to the LEASED jack on the back of the modem. Connect the other end of the cable to a four-wire leased line jack or terminals supplied by the telephone company.

2. Turn on the modem.

```
SYNC, NORM?
←,→,Ent
```

3. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, →, ↓, ↓, ↓, →, →, →, →. The **SYNC, NORM?** screen appears.

4. Press the **Enter** button to select normal synchronous operation.

```
OPTION SET
←,→
```

5. The **OPTION SET** screen appears. Press ↑← to exit to the **SYNC/ASYNCOPTIONS** screen.

```
4 WIRE LEASE?
ORIG. ←,→,Ent
```

6. Press ↑←, ↑←, ↑←, →, →, →, →, →. The **4 WIRE LEASE? ORIG** screen appears.

7. Choose one of two actions:

- To set up the modem as the originate modem, press the **Enter** button.
- To set up the modem as the answer modem, press → to display the **4 WIRE LEASE? ANSWER** screen, and then press the **Enter** button.

```
4 WIRE LEASE?
ANSWER ←,Ent
```

Note: One of the modems in a leased line pair must be configured as the originate modem, and the other as the answer modem, but it does not matter which is which.

```
OPTION SET
←,→
```

8. The **OPTION SET** screen appears. Press ↑← to exit to the **ONLINE OPTIONSSCREEN**, or → to exit to the **CURRENT SETTING=** screen.

9. This completes the setup for four-wire leased line operation. Upon completion, the modem attempts to connect to the modem at the other end of the leased line. If the remote modem has not yet been configured for leased line operation, you may turn off the local modem until the remote one is ready.

Dial Backup and Leased-Line Restoral

For four-wire leased line operation, the MT5600BA-V.92 modem has a dial backup capability, in which the modem is connected to a standard dial-up line as well as to the leased line. If the leased line fails, the originate modem automatically dials and connects to the answer modem through the standard telephone network. While it is in dial backup mode, the modem periodically checks the leased line to see if it is operational. If the line is operational, the modem then attempts to restore the leased line. If the modem detects that it is not connected to the standard telephone network when the leased line fails, it immediately switches to leased line restoral.

The dial-back timer, register **S17**, determines how long the modem waits after a leased line failure before it attempts a dial backup connection. The **S17** default setting is one minute. During that minute, the originate modem tries to establish the leased line link. If the leased line is established during that time, the **S17** timer is cleared and everything is back to normal. If the timer expires, the modem attempts a dial backup connection. The purpose of the timer for the answer modem is to determine when it can accept a dial-up call. Dial-back starts only when both timers have expired and the leased line is still down.

The restore timer, register **S15**, determines how frequently restoral attempts occur when the modems are in dial backup mode. **S15** can be set from 10 to 255 minutes in one minute increments. A value of 0 disables dial backup. The default value is 30 minutes.

Note: Register **S15** must be set identically on the local and remote modems.

The dial backup number must be set from the front panel of the modem.

Dial Backup and Leased Line Restoral Setup

1. Connect a modular telephone cable to the LINE jack of an MT5600BL modem set up for four-wire leased line operation. Connect the other end of the cable to a standard dialup line jack.
2. Turn on the modem.
3. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, ↓, →, ↓, →, →, →. The **ENTER NUMBER** screen appears.
4. Press the ↑↵ or ↓ button several times to select the first digit in the dial backup telephone number.
5. Press the → button to go to the next digit in the number.

ENTER NUMBER
78x

Note: To backspace or to cancel an entry, press → several times.

DIAL BACKUP #
STORED

6. The number can be up to 30 characters in length. Repeat steps 4 and 5 until the number is entered, and then press the **Enter** button to store it. The **DIAL BACKUP # STORED** screen appears.
7. Press the **Enter** button again to go to the **DIAL BACKUP NUMBER** screen.

DIAL BACKUP
NUMBER ←, →, ↓

Note: Steps 8 through 15 are optional.

TIME TO RESTORE
(S15) ←,→,↓
ENTER TIME IN
MINUTES 1

8. To change the default restore time, press ↓ to go to the **TIME TO RESTORE (S15)** screen, then press →, →. The **ENTER TIME IN MINUTES** screen appears.

9. Press the ↑← or ↓ button several times to select the first digit in the number.

10. Press the → button to go to the next digit in the number.

TIME STORED

11. Repeat steps 9 and 10 until you have entered a value between 10 and 255, or 0 to disable dial backup, and then press the **Enter** button to store it. The **TIME STORED** screen appears.

12. Press the **Enter** button to return to the **TIME TO RESTORE (S15)** screen.

TIME TO RESTORE
(S15) ←,→,↓

DIALBACKUP TIME
(S17) ←,→

ENTER TIME IN
MINUTES 1

13. To change the default dial backup time, press ↓ to go to the **DIAL BACKUP TIME (S17)** screen, then press →, →. The **ENTER TIME IN MINUTES** screen appears.

TIME STORED

14. Repeat steps 9 and 10 until you have entered a value between 0 and 255, and then press the **Enter** button to store it. The **TIME STORED** screen appears.

DIALBACKUP TIME
(S17) ←,→

15. Press the **Enter** button again to return to the **DIAL BACKUP TIME (S17)** screen.

16. Dial backup and leased line restoral setup is complete.

Note: Registers **S15** and **S17** can also be changed using the **Sr=n** AT command. See the AT Command Reference Guide on the CD that was shipped with your modem.

Note: The dial backup number can be displayed only 16 characters at a time. To see characters 17–30, press the ↓ button. To go to the previous screen, press the ← button. To go to the next screen, press the → button.

Chapter 5 - Remote Configuration

Remote configuration is a network management tool that allows you to configure modems anywhere in your network from one location. With password-protected remote configuration, you can issue AT commands to a remote MultiModemII modem for maintenance or troubleshooting as if you were on-site.

Basic Procedure

The following steps are valid regardless of whether the connection is established by the local or the remote MultiModemII modem.

1. Establish a data connection with a remote MT5600BA-V.92 modem.
2. Send three asterisks to initiate remote configuration. The remote modem responds:


```
Online Remote Access
Remote password:
```
3. Type the remote configuration password, and then press **ENTER**. The default is "MULTITECH." It is not case-sensitive.
 - If the password is incorrect, the word **CONNECT** appears, and the local modem is returned to online mode.
 - If the password is correct, an **>AT_** command prompt appears.
4. Type AT commands to configure the remote modem. It is not necessary to precede the commands with "AT."
5. When you have finished configuring the remote modem, type ***E** and press **ENTER** to exit remote configuration mode and return to online data mode. You can now break the connection in the normal way.

Note: The dialing command is not allowed in remote configuration mode.

Setup

Multi-Tech modems are shipped with a default setup password (MULTITECH). Because anyone who has an owner's manual knows the default setup password, for security you should change the password and possibly also the remote configuration escape character.

Changing the Remote Configuration Password

The remote configuration password can be changed only from the front panel of the modem:

1. Turn on the modem.
2. Starting at the **STATUS** screen, press **↓ ↓ ↓ → → ↓ →** to access the **ENTER PASSWORD** screen.



```
STATUS =
  →, ↓
```

3. To change the password, press $\uparrow\leftarrow$ or \downarrow to select the first character of the password, and then press \rightarrow to go to the next character. Repeat until you have entered the entire password.
4. To cancel the new password, press \rightarrow until the password is erased. To save the new password, press the **Enter** button. The next time you remotely configure the modem you must use the new password.

Changing the Remote Escape Character

To improve security, you can change a remote modem's remote configuration escape character. The remote configuration escape character is stored in register **S13**. The factory default is 42, which is the ASCII code for the asterisk character (*). Setting **S13** to 0 (zero) disables remote configuration entirely—but if you do this remotely, you won't be able to change it back remotely!

1. Establish a remote configuration link with the remote modem as described in "Basic Procedure."
2. Type **ATS13=*n***, where *n* is the ASCII code for the new remote configuration escape character, and then press ENTER.
3. Save the new value by typing **AT&W** and pressing ENTER.
4. Type **ATO<CR>** to exit remote configuration.

Chapter 6 - Callback Security

This chapter describes how to use callback security with your modem.

Callback security protects your network from unauthorized access and helps control long distance costs. When callback security is enabled, all callers are requested to enter a password. If the password is invalid, the caller can try twice more before the modem hangs up. If the password is valid, the modem hangs up and returns the call by dialing the phone number associated with the password.

It is possible to implement password protection without callback by storing a hyphen (-) before the callback phone number. The caller must then append a hyphen to his password to establish the direct connection.

The modem can store up to 30 callback phone numbers and 30 callback passwords. Phone numbers can be up to 30 characters long and can contain the pause (,) and wait (W) characters in addition to the digits and characters normally found on a touch-tone keypad. Passwords can be up to 10 characters long.

Callback phone numbers are associated with callback passwords by being assigned to the same callback memory location. For example, if you assign the password "APRICOT" to memory location 16 and, in a separate operation, also assign phone number 6127853000 to memory location 16, the modem calls phone number 6127853000 when it receives the password "APRICOT."

Because there is no way to examine the passwords and phone numbers stored in the modem, it is important to write them down as you enter them. A form that you can print out for this purpose is provided on the last page of this chapter.

Setup Procedures

Turning Callback Security On and Off

Note: Autoanswer must be enabled (**S0=1** or **S0=2**) for callback security to work.

AT Command Method

1. Open a terminal program, such as HyperTerminal.
2. In the terminal window, type one of the following commands:
 - To turn on callback security, type **AT#DB1** and press ENTER. With remote callback security turned on, each caller is asked to enter a password, then is disconnected and called back by the modem. Also, dialing number locations 0–3, for use with the **DS=y** dialing command, are replaced by callback dialing number locations 1–30.
 - To turn off callback security, type **AT#DB0** and press ENTER. Callers no longer need a password to connect to the modem, the modem is unable to call them back, and stored dialing number locations 0–3 become available.

Front Panel Method

1. Turn on the modem.
2. Starting at the **STATUS** screen, press the following buttons on the front panel to turn callback security on and off:

STATUS =
→, ↓

- To turn on callback security, press ↓, ↓, →, ↓, ↓, →, → to display the **CALLBACK ON?** option, and then press the **Enter** button to select the option. When remote callback security is turned on, each caller is asked to enter a password, then is disconnected and called back by the modem. Also, dialing number locations 0–3, for use with the **DS=y** dialing command, are replaced by callback dialing number locations 1–30.

CALLBACK OFF?
←, Ent

- To turn off callback security, press ↓, ↓, →, ↓, ↓, →, →, → to display the **CALLBACK OFF?** option, and then press the **Enter** button to select the option. Callers no longer need a password to connect to the modem, the modem is unable to call them back, and stored dialing number locations 0–3 become available.

Assigning Callback Passwords

AT Command Method

1. Open a terminal program, such as HyperTerminal.
2. To store a callback password for the first callback memory location, type **AT#CBP01=xxxxxxxx**, where **xxxxxxxx** is the first password, and press **ENTER**. The password must be six to ten characters in length.
3. To store a callback password for the second callback memory location, type **AT#CBP02=xxxxxxxx**, where **xxxxxxxx** is the second password, and press **ENTER**. Note that the memory location number in the command is incremented by one.
4. Repeat as many times as necessary, up to memory location 30, until all passwords have been entered.

Front Panel Method

1. Turn on the modem.
2. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, ↓, →, ↓, ↓, →, ↓, →. The **ENTER PASSWORD #1?** screen appears.
3. Press the **Enter** button on the front panel to select callback memory location 1. The **ENTER PASSWORD** screen appears.
4. Press the ↑← or ↓ button several times to select the first letter in the password.
5. Press the → button to go to the next letter in the password.

ENTER PASSWORD
#1? ←, →, Ent

ENTER PASSWORD
A

Note: To backspace or to cancel an entry, press → several times.

PASSWORD STORED

6. The password must be six to ten characters in length. Repeat steps 4 and 5 until the password is entered, and then press the **Enter** button to store it. The **PASSWORD STORED** screen should appear.

```
PASSWORD SETUP
←, →, ↓
```

7. Press the **Enter** button again to go to the **PASSWORD SETUP** screen.
8. Press →, → to go to the **ENTER PASSWORD #2?** screen.
9. Repeat steps 3–7 to enter the next password.
10. Repeat as many times as necessary, up to memory location 30, until all passwords have been entered.

Warning: There is no way to review an entry to confirm that it has been entered correctly. If you attempt to look at a password entry by pressing the **Enter** button for an **ENTER PASSWORD #n?** screen, it is possible to accidentally erase the entry.

Assigning Callback Phone Numbers

AT Command Method

1. Open a data communication program, such as HyperTerminal.
2. To store a callback phone number in the first memory location, type **AT#CBN01=xxxxxxxx**, where **xxxxxxxx** is the dialing string, and press **ENTER**. The dialing string can include the digits 0 through 9 and any of the following characters: #, *, comma (,), semicolon (;), W, A, B, C, and D. Up to 30 characters can be used. Example: **AT#CBN01=9,16127853000**. If a direct connection with password protection, but without hangup and callback, is desired, the first character in the dialing string should be a hyphen (-).
3. To store a callback phone number in the second memory location, type **AT#CBN02=xxxxxxxx**, where **xxxxxxxx** is the dialing string, and press **ENTER**. Note that the memory location number in the command is incremented by one.
4. Repeat as many times as necessary, through memory location 30, until all dialing strings have been entered.

Front Panel Method

```
ENTER NUMBER
#1? ←, →, Ent
```

```
ENTER NUMBER
78x
```

1. Turn on the modem.
2. Starting at the **STATUS** screen, press the following buttons on the front panel: ↓, ↓, →, ↓, ↓, →, ↓, ↓, →. The **ENTER NUMBER #1?** screen appears.
3. Press the **Enter** button on the front panel to select memory location 1. The **ENTER NUMBER** screen appears.
4. Press the ↑← or ↓ button several times to select the first character. If a direct connection, without hangup and callback, is desired, the first character in the dialing string should be a hyphen (-).
5. Press the → button to go to the next character in the dialing string.

Note: To backspace or to cancel an entry, press → several times.

```
NUMBER STORED
```

```
CALLBACK NUMBER
←, →
```

6. The number can be up to 30 characters in length. Repeat steps 4 and 5 until the number is entered, and then press the **Enter** button to store it. The **NUMBER STORED** screen should appear.
7. Press the **Enter** button again to go to the **CALLBACK NUMBER** screen.

8. Press →, → to go to the **ENTER NUMBER #2?** screen.
9. Repeat steps 3–7 to enter the next number.
10. Repeat as many times as necessary, up to memory location 30, until all numbers have been entered.

Warning: There is no way to review an entry to confirm that it has been entered correctly. If you attempt to look at a number entry by pressing the **Enter** button for an **ENTER NUMBER #n?** screen, it is possible for you to accidentally erase the entry.

Calling Procedure

Use the following procedure to call a modem that has callback security enabled.

Note: Autoanswer must be enabled on the calling modem (**S0=1** or **S0=2**).

1. Using a data communication program such as HyperTerminal, dial the number of the callback modem.
2. When the connection is established, the callback modem responds with a request for a password.
3. Type the password for your modem, and then press **ENTER**. You have three attempts to enter a valid password or be disconnected.
4. If the password is valid, the callback modem disconnects. Then, after a short delay, it calls the number associated with the password and establishes a working connection.

Note: If you are calling a direct connect number, you must append a hyphen (-) to the password. If the corresponding phone number has - as its first character, you will be able to go directly online with the callback modem. If the corresponding phone number has no - character, you will be prompted for a different password.

Callback Security Commands

The following AT commands are used with callback security.

```
CALLBACK ON?
*,*,Ent
CALLBACK OFF?
*,Ent
```

Command: **#DBn Callback Enable/Disable**

Values: $n = 0$ or 1

Default: 0

Description: Enables or disables callback security. When callback security is enabled, phone number memory locations 0–4, used for quick dialing and DTR dialing, become unavailable and are replaced by callback security memory locations 1–30. The phone number memory locations and their contents are restored when callback security is disabled.

#DB0 Disables callback security.

#DB1 Enables callback security.

```
ENTER NUMBER
#1? *,*,Ent
```

Command: **#CBNy=[-]x Store Callback Number**

Values: $y = 01-30$
 $x =$ dialing string

Default: None

Description: Stores the callback dialing string x in memory location y . The dialing string can include the digits 0 through 9 and any of the following characters: #, *, comma (,), semicolon (;), *W*, *A*, *B*, *C*, and *D*. Up to 30 characters can be used. Example: **AT#CBN01=9,16127853000**. If the optional - character precedes the dialing string, and the caller appends the same character to the password, the caller is connected immediately, and the hangup and callback are skipped.

```
ENTER PASSWORD
#1? *,*,Ent
```

Command: **#CBPy=x Store Callback Password**

Values: $y = 01-30$
 $x =$ password (6–10 characters)

Defaults: None

Description: Stores callback security password x in memory location y . The password must have 6 to 10 characters.

Note: A direct connect password may not end with a hyphen (-).

Callback Assignments Form

<u>Location</u>	<u>Password</u>	<u>Phone Number</u>
<u>01</u>		
<u>02</u>		
<u>03</u>		
<u>04</u>		
<u>05</u>		
<u>06</u>		
<u>07</u>		
<u>08</u>		
<u>08</u>		
<u>10</u>		
<u>11</u>		
<u>12</u>		
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<u>21</u>		
<u>22</u>		
<u>23</u>		
<u>24</u>		
<u>25</u>		
<u>26</u>		
<u>27</u>		
<u>28</u>		
<u>29</u>		
<u>30</u>		

Chapter 7 - Troubleshooting

Your modem was thoroughly tested at the factory before it was shipped. If you are unable to make a successful connection, or if you experience data loss or garbled characters during your connection, it is possible that the modem is defective. However, it is more likely that the source of your problem lies elsewhere. The following symptoms are typical of problems you might encounter:

- None of the LEDs light when the modem is on.
- The modem does not respond to commands.
- The modem cannot connect when dialing.
- The modem disconnects while online.
- The modem cannot connect when answering.
- File transfer is slower than it should be.
- Data is being lost.
- There are garbage characters on the monitor.
- The modem doesn't work with Caller ID.
- Fax and data software can't run at the same time.

If you experience problems, please check the following possibilities before calling Technical Support (see Appendix C).

None of the Indicators Light

When you turn on the modem, the LED indicators on the front panel should flash briefly as the modem runs a self-test, and the liquid crystal display (LCD) should light. If the LEDs and LCD remain off, the modem is probably not receiving power.

- Make sure the modem's power switch is on, especially if you normally turn the modem on by turning on a power strip.
- If the modem is plugged into a power strip, make sure the power strip is plugged in and its power switch is on.
- Make sure the transformer module is firmly connected to the modem and to the wall outlet or power strip.
- If the power strip is on and the modem switch is on, try moving the transformer module to another outlet on the power strip.
- Test that the outlet is live by plugging another device, such as a lamp, into it.
- The modem or transformer module may be defective. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, the first modem or transformer module may be defective. Call Technical Support for assistance.

CAUTION: Do not under any circumstances replace the transformer module with one designed for another product; doing so can damage the modem and void your warranty.

The Modem Does Not Respond to Commands

- Make sure the modem is plugged in and turned on. (See “None of the Indicators Light.”)
- Make sure you are issuing the modem commands from data communication software, either manually in terminal mode or automatically by configuring the software. (You cannot send commands to the modem from the DOS prompt.)
- Make sure you are in terminal mode in your data communication program, then type **AT** and press **ENTER**. If you get an *OK* response from your modem, your connections are good and the problem likely is in the connection setup in your communication software.
- Try resetting your modem by turning it off and on. If you are using DOS or Windows 3.1 communication software, make sure the initialization string includes **&F** as the first command, to cancel any “leftover” command that could affect the modem’s operation.
- If you don’t get an *OK*, the problem may still be in the communication software. Make sure you have done whatever is necessary in your software to make a port connection. Not all communication programs connect to the COM port automatically. Some connect when the software loads and remain connected until the program terminates. Others can disconnect without exiting the program. The modem’s TR indicator lights to show that the software has taken control of the modem through the COM port.
- Your communication software settings may not match the physical port the modem is connected to. The serial cable might be plugged into the wrong connector—check your computer documentation to make sure. Or you might have selected a COM port in your software other than the one the modem is physically connected to—compare the settings in your software to the physical connection.
- If the modem is on, the cable is plugged into the correct port, the communication software is configured correctly, and you still don’t get an *OK*, the fault might be in the serial cable. Make sure it is firmly connected at both ends.
- Is this the first time you have used the cable? If so, it may not be wired correctly. Check the cable description on the packaging to make sure the cable is the right one for your computer.
- Peripheral expansion cards, such as sound and game cards, might include a serial port preconfigured as COM1 or COM2. The extra serial port, or the card itself, may use the same COM port, memory address, or interrupt request (IRQ) as your communication port. Be sure to disable any unused ports.

Windows 3.1x: To look for address or IRQ conflicts, in Program Manager select **File | Run**, type **MSD**, and press **ENTER**. Then select **Mouse, COM Ports**, and **IRQ Status**, and note the addresses and IRQs that are in use. If you find an IRQ conflict, note which IRQs are not being used, then change one of the conflicting devices to use one of the unused IRQs. If you find an address conflict, change the address of one of the conflicting devices.

To change a port address or IRQ in Windows 3.1x, double-click the Control Panel icon, then the Ports icon. Click on the port you want to change, click **Settings**, click **Advanced**, and select the new port address and/or interrupt. If you wish to use COM3 or COM4, note that COM3 shares an IRQ with COM1, as does COM4 with COM2, so you should change their IRQs to unused ones, if possible.

Windows 9x: Right-click on My Computer, select **Properties** from the menu, click on the **Device Manager** tab, double-click on **Ports**, then double-click on the communication port your modem is connected to. In the port's **Properties** sheet, click on the **Resources** tab to see the port's input/output range and interrupt request. If another device is using the same address range or IRQ, it appears in the **Conflicting Device List**. Uncheck **Use automatic settings** to change the port's settings so they do not conflict with the other device, or select the port the conflicting device is on and change it instead. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device's documentation.

Windows NT 4.0: To look for address or IRQ conflicts, click Start, Programs, Administrative Tools (Common), and Windows NT Diagnostics. In the **Windows NT Diagnostics** dialog box, click the **Resources** tab to see which input/output ranges and interrupt requests are in use. If you need to open your computer to change switches or jumpers on the conflicting device; refer to the device's documentation.

- The serial port might be defective. If you have another serial port, install the modem on it, change the COM port setting in your software, and try again.
- The modem might have a problem beyond the scope of this user guide. If you have another Multi-Tech modem, try swapping modems. If the problem goes away, call Technical Support for assistance (see Appendix D).

The Modem Cannot Connect When Dialing

There can be several reasons the modem fails to make a connection. Possibilities include:

- lack of a physical connection to the telephone line.
- a wrong dial tone.
- a busy signal.
- a wrong number.
- no modem at the other end.
- a faulty modem, computer, or software at the other end.
- incompatibility between modems.

You can narrow the list of possibilities by using extended result codes. Extended result codes are enabled by default. If they have been disabled, include **V1X4** in the modem's initialization string, or in terminal mode enter **ATV1X4** and press ENTER. When you dial again, the modem reports the call's progress.

- If the modem reports *NO DIALTONE*, check that the modem's telephone line cable is connected to both the modem's LINE jack (not the PHONE jack) and the telephone wall jack. If the cable looks secure, try replacing it. If that doesn't work, the problem might be in your building's telephone installation. To test the building installation, plug a telephone into your modem's telephone wall jack and listen for a dial tone. If you hear a dial tone, your modem might be installed behind a corporate phone system (PBX) with an internal dial tone that sounds different from the normal dial tone. In that case, the modem might not recognize the dial tone and might treat it as an error. Check your PBX manual to see if you can change the internal dial tone; if you can't, change your modem's initialization string to replace **X4** with **X3**, which will cause the modem to ignore dial tones (note, however, that **X3** is not allowed in some countries, such as France and Spain).

- If the modem reports **BUSY**, the other number might be busy, in which case you should try again later, or it might indicate that you have failed to add a **9**, prefix to the phone number if you must dial **9** for an outside line.

If you must dial **9** to get an outside line, the easiest way to dial it automatically is to include it in the modem's dial prefix, e.g., **ATDT9**. Note the comma, which inserts a pause before the number is dialed. By inserting **9**, into the dial prefix, you do not have to include it in each directory entry.

To change the dial prefix in Windows 95 HyperTerminal, select **Connect** from the **Call** menu, click **Dialing Properties**, and type **9** in the local and long distance boxes in **How I dial from this location**.

- If the modem reports **NO ANSWER**, the other system has failed to go off-hook, or you might have dialed a wrong number. Check the number.
- If the modem reports **NO CARRIER**, the phone was answered at the other end, but no connection was made. You might have dialed a wrong number, and a person answered instead of a computer, or you might have dialed the correct number but the other computer or software was turned off or faulty. Check the number and try again, or try calling another system to make sure your modem is working. Also, try calling the number on your telephone. If you hear harsh sounds, then another modem is answering the call, and the modems might be having problems negotiating because of modem incompatibilities or line noise. Try connecting at a lower speed.

The Modem Disconnects While Online

- If you have Call Waiting on the same phone line as your modem, it can interrupt your connection when someone tries to call you. If you have Call Waiting, disable it before each call. In most telephone areas in North America, you can disable Call Waiting by preceding the telephone number with ***70** (check with your local telephone company).

You can automatically disable Call Waiting by including the disabling code in the modem's dial prefix (e.g., **ATDT*70**,—note the comma, which inserts a pause before the number is dialed). To change the dial prefix in Windows Terminal, select **Settings | Modem Commands**. To change it in HyperTerminal, select **Connect** from the **Call** menu, click **Dialing Properties**, check **This location has Call Waiting**, and select the correct code for your phone service.

- If you have extension phones on the same line as your modem, you or someone else can interrupt the connection by picking up another phone. If this is a frequent problem, disconnect the extension phones before using the modem, or install another phone line especially for the modem.
- Check for loose connections between the modem and the computer, the telephone jack, and AC power.
- You might have had a poor connection because of line conditions or the problem might have originated on the other end of the line. Try again.
- If you were online, it might have hung up on you because of lack of activity on your part or because you exceeded your time limit for the day. Try again.

The Modem Cannot Connect When Answering

- The default DTR Control command (**&D2**) inhibits autoanswer. To enable autoanswer, change DTR Control to **&D0**, and make sure **&Q0**, **&Q1**, **&Q5**, or **&Q6** is also set. For more information, see the **&D** command in the AT Command Reference Guide on the CD shipped with your modem. For information on changing the modem's default configuration, see "Step 3: Install and Configure Your Software" in Chapter 2.
- Autoanswer might be disabled. Turn on autoanswer in your datacomm program or send the command **ATS0=1** (**ATS0=2** if you have Caller ID service) to your modem in terminal mode.

File Transfer Is Slower Than It Should Be

- You might have an older UART. For best throughput, install a 16550AFN UART or a Multi-Tech ISI serial port card.
- If you are running under Windows 3.1 and have a 16550AFN UART, you must replace the Windows serial driver, COMM.DRV, to take full advantage of the UART's speed.
- If you are using a slow transfer protocol, such as Xmodem, try Zmodem or Ymodem/G instead.
- Is your line noisy? If there is static on your line, the modem has to resend many blocks of data to insure accuracy. You must have a clean line for maximum speed.
- Are you downloading a compressed file with MNP 5 hardware compression enabled? Since hardware data compression cannot compress a file already compressed by an archiving program, the transfer can be marginally slower with data compression enabled than with it disabled.
- Does your Internet service provider (ISP) use the same 56K protocol as your modem? The default setting of your modem is to connect using either the 56K or the V.90 protocol, depending on which one the ISP modem is using. If your ISP uses the X2 protocol, the maximum speed you will be able to connect at is 33,600 bps. Check with your ISP to see which protocols it supports, and check the Multi-Tech Web site for the latest developments in V.92.
- Try entering the **&V1** command to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

Data Is Being Lost

- If you are using data compression and a high speed serial port, set the serial port baud rate to four times the data rate.
- Your UART might not be reliable at serial port speeds over 9600 bps or 19,200 bps. Turn off data compression, reset your serial port speed to a lower rate, or replace your serial port with a faster one.
- Make sure the flow control method you selected in software matches the method selected in the modem. If you are using the modem with a Macintosh, you might have the wrong cable for hardware flow control.

- Try entering the **&V1** command to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

There Are Garbage Characters on the Monitor

- Your computer and the remote computer might be set to different word lengths, stop bits, or parities. If you have connected at 8-N-1, try changing to 7-E-1, or vice-versa, using your communication software.
- You might be experiencing line noise. Enable error correction, if it is disabled, or hang up and call again; you might get a better connection the second time.
- At speeds above 2400 bps, the remote modem might not use the same transmission or error correction standards as your modem. Try connecting at a slower speed or disabling error correction. (With no error correction, however, line noise can cause garbage characters.)
- Try entering the **&V1** command to display information about the last connection, making a screen print of the connection statistics, and checking for parameters that might be unacceptable.

The Modem Doesn't Work with Caller ID

- Caller ID information is transmitted between the first and second rings, so if autoanswer is turned off (**S0=0**) or if the modem is set to answer after only one ring (**S0=1**), the modem will not receive Caller ID information. Check your initialization string, and if necessary change it to set the modem to answer after the second ring (**S0=2**).
- Make sure that you have Caller ID service from your telephone company.

Fax and Data Software Can't Run at the Same Time

- Communication devices can be accessed by only one application at a time. Under DOS or Windows 3.1x, you can run either your fax software or your datacomm software, but not both at the same time, unless you have a special communication device management application. In Windows 95, 98, and NT 4.0, you can have data and fax communication applications open at the same time, but they cannot use the same modem at the same time.

Appendix A - Regulatory Compliance

FCC Part 68 Telecom

1. This equipment complies with part 68 of the Federal Communications Commission Rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number. This information must be provided to the telephone company.
2. The suitable USOC jack (Universal Service Order Code connecting arrangement) for this equipment is shown below. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown.
3. An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant. See installation instructions for details.
4. The ringer equivalence number (REN) is used to determine the number of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the device not ringing in response to an incoming call. In most, but not all, areas the sum of the RENs should not exceed 5.0. To be certain of the number of devices that may be connected to the line, as determined by the total RENs, contact the local telephone company.
5. If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify you as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.
6. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications in order to maintain uninterrupted service.
7. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.
8. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.
9. This equipment should not be used on party lines or coin lines.
10. If so required, this equipment is hearing-aid compatible.
11. Manufacturing Information:

Manufacturer:	Multi-Tech Systems, Inc.
Trade Name	MultiModemII
Model Number:	MT5600BA
FCC Registration No:	AU7USA-33378-M5-E
Ringer Equivalence No:	0.1A
Modular Jack (USOC):	RJ11C or RJ11W (single line)
Service Center in USA:	Multi-Tech Systems, Inc. 2205 Woodale Drive Mounds View, MN 55112 U.S.A. (763) 785-3500 (763) 785-9874 Fax

Fax Branding Statement

The Telephone Consumer Protection Act of 1991 makes it unlawful for any person to use a computer or other electronic device, including fax machines, to send any message unless such message clearly contains the following information:

- Date and time the message is sent
- Identification of the business or other entity, or other individual sending the message
- Telephone number of the sending machine or such business, other entity, or individual

This information is to appear in a margin at the top or bottom of each transmitted page or on the first page of the transmission. (Adding this information in the margin is referred to as *fax branding*.)

Since any number of fax software packages can be used with this product, the user must refer to the fax software manual for setup details. Typically the fax branding information must be entered via the configuration menu of the software.

Canadian Limitations Notice

Notice: The ringer equivalence number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalence numbers of all the devices does not exceed 5.

Notice: The Industry Canada label identifies certificated equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Industry Canada label does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations. Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment or equipment malfunctions may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.



EMC, Safety, and R&TTE Directive Compliance

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility;
and
- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;
and
- Council Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

International Modem Restrictions

Some dialing and answering defaults and restrictions may vary for international modems. Changing settings may cause a modem to become non-compliant with national telecom requirements in specific countries. Also note that some software packages may have features or lack restrictions that may cause the modem to become non-compliant.

New Zealand Telecom Warning Notice

1. The grant of a Telepermit for any item of terminal equipment indicates only that Telecom has accepted that the item complies with minimum conditions for connection to its network. It indicates no endorsement of the product by Telecom, nor does it provide any sort of warranty. Above all, it provides no assurance that any item will work correctly in all respects with another item of Telepermitted equipment of a different make or model, nor does it imply that any product is compatible with all of Telecom's network services.

This equipment is not capable under all operating conditions of correct operation at the higher speed which it is designated. 33.6 kbps and 56 kbps connections are likely to be restricted to lower bit rates when connected to some PSTN implementations. Telecom will accept no responsibility should difficulties arise in such circumstances.

2. Immediately disconnect this equipment should it become physically damaged, and arrange for its disposal or repair.
3. This modem shall not be used in any manner which could constitute a nuisance to other Telecom customers.

4. This device is equipped with pulse dialing, while the Telecom standard is DTMF tone dialing. There is no guarantee that Telecom lines will always continue to support pulse dialing.

Use of pulse dialing, when this equipment is connected to the same line as other equipment, may give rise to 'bell tinkle' or noise and may also cause a false answer condition. Should such problems occur, the user should not contact the Telecom Faults Service.

The preferred method of dialing is to use DTMF tones, as this is faster than pulse (decadic) dialing and is readily available on almost all New Zealand telephone exchanges.

5. Warning Notice: No '111' or other calls can be made from this device during a mains power failure.
6. This equipment may not provide for the effective hand-over of a call to another device connected to the same line.
7. Some parameters required for compliance with Telecom's Telepermit requirements are dependent on the equipment (PC) associated with this device. The associated equipment shall be set to operate within the following limits for compliance with Telecom's Specifications:

For repeat calls to the same number:

- There shall be no more than 10 call attempts to the same number within any 30-minute period for any single manual call initiation, and
- The equipment shall go on-hook for a period of not less than 30 seconds between the end of one attempt and the beginning of the next attempt.

For automatic calls to different numbers:

- The equipment shall be set to ensure that automatic calls to different numbers are spaced such that there is no less than 5 seconds between the end of one call attempt and the beginning of another.

For automatically answered incoming calls:

- The equipment shall be set to ensure that calls are answered between 3 and 30 seconds of receipt of ringing.

8. For correct operation, total of the RNs of all devices connected to a single line at any time should not exceed 5.

South African Notice

This modem must be used in conjunction with an approved surge protection device.

Appendix B - Technical Specifications

Your MultiModemII modem meets the following specifications:

Trade Name	MultiModemII™
Model Number	MT5600BA-V.92, MT5600-V.90, MT5600BL
Server-to-Client Data Rates	56K or V.92 speeds when accessing a 56K or V.92 server (actual speed depends on server capabilities and line conditions)
Client-to-Client Data Rates	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, 2400, 1200, 0-300 bps
Fax Data Rates	14400, 12000, 9600, 7200, 4800, 2400, 300 bps
Data Format	Serial, binary, synchronous and asynchronous
Commands	AT, V.25bis, TIA/EIA TR.29 Class 2
Command Buffer	60 characters
Modem Compatibility	ITU-T V.90, v.92; 56K ITU-T V.34 enhanced, V.34, V.32terbo, V.32bis, V.32, V.25bis, V.22bis, V.22; Bell 212A and 103/113; ITU-T V.42, V.42bis; ITU-T V.21 & V.23 in international versions, v.44
Fax Compatibility	ITU-T Group 3, Class 1 and 2, T.4, T.30, V.21, V.27ter, V.29, V.17, and TIA/EIA TR29.2, V.34, V.17
Error Correction	ITU-T V.42 (LAP-M or MNP 3 and 4)
Data Compression	ITU-T V.42bis (4:1 throughput), MNP 5 (2:1 throughput)
Speed Conversion	Serial port data rates adjustable to 300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, and 230400 bps
Mode of Operation	Fax online modes; full duplex over dial-up and two-wire or four-wire leased lines; data mode, command mode, online command mode, V.54 test mode
Flow Control	XON/XOFF (software), RTS/CTS (hardware)
Intelligent Features	Plug and Play; AT command compatible; autodial, redial, repeat dial; pulse or tone dial; dial pauses; auto answer; Caller ID; remote configuration; adaptive line probing; automatic symbol and carrier frequency during start-up, retrain, and rate renegotiation; DTMF detection; call status display, auto-parity and data rate selection; keyboard- and front panel-controlled modem options; monitor and LCD displays for modem options; non-volatile memory; storage of up to four command strings or telephone numbers of up to 40 characters each
Transmission Level	-11 dBm (dial-up—varies depending on country setting), -10 dBm (leased-line)

Frequency Stability	±0.01%
Receiver Sensitivity	-43 dBm under worst-case conditions
AGC Dynamic Range	43 dB
Interface	TIA/EIA RS-232C/ITU-T V.24/V.28
Connectors	DB25F RS-232C connector; two RJ-11 phone jacks (BA model) or three RJ-11 phone jacks (BL model); power connector
Cables	Three modular telephone cords (USA); country-specific cordage for International models; one 9-pin to 25-pin serial cable for International models; external power transformer
	Note: Any cables connected to the computer should be shielded to reduce interference.
Diagnostics	Power-on self test, local analog loop, local digital loop, remote digital loop
Indicators	32-character backlit LCD for status and configuration information; LEDs for Transmit Data, Receive Data, Carrier Detect, Off Hook, Terminal Ready, and Test Mode
Speaker	1-inch speaker for call progress monitoring
Manual Controls	Power switch, speaker volume control, four LCD control buttons
Environmental	Temperature range 0°–50°C (32°–120°F) ambient under closed conditions; humidity range 20–90% (non-condensing)
Storage Temperature	-10° to +85°C (14°–185°F)
Power Requirement	120 VAC, 60 Hz, 16 W; 230V/50 Hz optional (international)
Power Consumption	12 W @ 0.1 A typical
Dimensions	15.8 cm wide × 22.9 cm long × 3.6 cm high (6.2" × 9.0" × 1.4")
Weight	0.9 kg (2 lb.)
Limited Warranty	10 years

Appendix C - Warranty, Service, and Technical Support

Multi-Tech Systems, Inc. Warranty & Repairs Policies

Warranty

Multi-Tech Systems, Inc., (hereafter "MTS") warrants that its products will be free from defects in material or workmanship for a period of two, five, or ten years (depending on model) from date of purchase, or if proof of purchase is not provided, two, five, or ten years (depending on model) from date of shipment.

MTS MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by Customer or any party without MTS's written authorization, or used in any manner inconsistent with MTS's instructions.

MTS's entire obligation under this warranty shall be limited (at MTS's option) to repair or replacement of any products which prove to be defective within the warranty period or, at MTS's option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS's factory – transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES, AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PRICE FOR DEFECTIVE PRODUCTS.

Repair Procedures for U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota factory:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112
Attn: Repairs, Serial # _____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS.

Please include, inside the shipping box, a description of the problem, a return shipping address (must have a street address, not P.O. Box), your telephone number, and, if the product is out of warranty, a check or purchase order for repair charges.

For out of warranty repair charges, go to <http://www.multitech.com/documents/warranties>.

Extended two-year overnight replacement service agreements are available for selected products. Please call MTS at (888) 288-5470, extension 5308 or visit our Web site at <http://www.multitech.com/programs/orc/> for details on rates and coverages.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc. to our Technical Support department at (800) 972-2439, or email tsupport@multitech.com. Please direct your questions regarding repair expediting, receiving, shipping, billing, etc. to our Repair Accounting department at (800) 328-9717 or (763) 717-5631, or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, power surges, incorrect installation, physical abuse, or user caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Customers (Outside U.S.A. and Canada)

Your original point of purchase Reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product.

<http://www.multitech.com/COMPANY/offices/DEFAULT.ASP>

In the event that factory service is required, products may be shipped, freight prepaid to our Mounds View, Minnesota factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. A Returned Materials Authorization (RMA) is required for products shipped from outside the U.S.A. and Canada. Please contact us for return authorization and shipping instructions on any International shipments to the U.S.A. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check drawn on a U.S. bank or your company's purchase order for repair charges. Repaired units shall be shipped freight collect, unless other arrangements are made in advance.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department nearest you or email tsupport@multitech.com. When calling the U.S., please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at

+(763) 717-5631 in the U.S.A., or email mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

Repair Procedures for International Distributors

Procedures for International Distributors of Multi-Tech products are on the distributor Web site.

<http://www.multitech.com/PARTNERS/login/>

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10-Sep-01

Online Warranty Registration

If you have access to the World Wide Web, you can register your Multi-Tech product online at <http://www.multitech.com/register/>.

Service

U.S. and Canadian Customers

In the event that service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota, factory:

Multi-Tech Systems, Inc.
2205 Woodale Drive
Mounds View, MN 55112

Attn: Repairs, Serial # _____

A Returned Materials Authorization (RMA) is not required. Return shipping charges (surface) will be paid by MTS. Please include inside the shipping box a description of the problem, a return shipping address (must have street address, not P.O. Box), a telephone number, and if the product is out of warranty, a check or purchase order for repair charges.

For out of warranty repair charges, go to <http://www.multitech.com/documents/warranties>.

Extended two-year overnight replacement agreements are available for selected products. Please call MTS at 888 288-5470, extension 5308, or visit our web site at <http://www.multitech.com/PROGRAMS/orc/> for details on rates and coverages.

Please direct your questions regarding technical matters, product configuration, verification that the product is defective, etc., to our Technical Support department at 800 972-2439 or e-mail tsupport@multitech.com.

Please direct your questions regarding repair expediting, receiving, shipping, billing, etc., to our Repair Accounting department at 800 328-9717 or +763 785-3500, or e-mail mtsrepair@multitech.com.

Repairs for damages caused by lightning storms, water, power surges, incorrect installation, physical abuse, or user-caused damages are billed on a time-plus-materials basis.

International Customers (outside U.S.A. and Canada)

Your original point of purchase reseller may offer the quickest and most economical repair option for your Multi-Tech product. You may also contact any Multi-Tech sales office for information about the nearest distributor or other repair service for your Multi-Tech product: <http://www.multitech.com/COMPANY/offices/DEFAULT.ASP>.

In the event that factory service is required, products may be shipped, freight prepaid, to our Mounds View, Minnesota, factory. Recommended international shipment methods are via Federal Express, UPS or DHL courier services, or by airmail parcel post; shipments made by any other method will be refused. A Returned Materials Authorization (RMA) is required for products shipped from outside the U.S.A. and Canada. Please contact us for return authorization and shipping instructions on any international shipments to the U.S.A. Please include, inside the shipping box, a description of the problem, a return shipping address (must have street address, not P.O. Box), your telephone number, and if the product is out of warranty, a check drawn on a U.S. bank or your company's purchase order for repair charges. Repaired units will be shipped freight collect, unless other arrangements are made in advance.

International Distributors

Procedures for international distributors of Multi-Tech products are on the Distributor Web site at <http://www.multitech.com/PARTNERS/login/>.

Replacement Parts

SupplyNet, Inc. can supply you with replacement power supplies, cables and connectors for selected Multi-Tech products. You can place an order with SupplyNet via mail, phone, fax, or the Internet at the following addresses:

Mail: SupplyNet, Inc.
614 Corporate Way
Valley Cottage, NY 10989
Phone: 800-826-0279
Fax: 914-267-2420
Email: info@supplynet.com
Internet: <http://www.thesupplynet.com>

Technical Support

Multi-Tech Systems has an excellent staff of technical support personnel available to help you get the most out of your Multi-Tech product. If you have any questions about the operation of this unit, please call 800 972-2439 (USA and Canada) or 763 785-3500 (international and local). Please have modem information available. You can also contact Technical Support by e-mail at the following addresses:

Country	Email	Telephone
France:	support@multitech.fr	+(33) 1-64 61 09 81
India:	support@multitechindia.com	+91 (124) 6340778
U.K.:	support@multitech.co.uk	+(44) 118 959 7774
U.S.A., Canada	tsupport@multitech.com	800 972-2439
Rest of world:	tsupport@multitech.com	+763 717-5863

Please note the status of the modem before contacting Technical Support. Status information can include the state of the LED indicators, screen messages, diagnostic test results, problems with a specific application, etc.

Internet Sites

Multi-Tech is a commercial provider on the Internet. Multi-Tech has a Web site at <http://www.multitech.com> and an ftp site at <ftp://ftp.multitech.com>

Appendix D - Upgrading the Firmware

Introduction

Your modem is controlled by semi-permanent software, called *firmware*, which is stored in flash memory. Firmware is nonvolatile; that is, it remains stored in memory when the modem is turned off. However, it can be changed by either the manufacturer or the user as bugs are fixed or new features are added.

Since the firmware in your modem is stored in flash memory, you can upgrade it yourself in a few minutes by using the following procedures.

Upgrade Overview

The upgrade procedure consists of the following steps, which are described in greater detail in the following sections.

1. Identify the model number and firmware version of your modem.
2. Identify the current version of the firmware at the Multi-Tech Web site. If your modem already has the current firmware, there is no need to update it.
3. Download the upgrade file for your modem.
4. Extract the firmware .HEX file and the appropriate flash upgrade program from the file you downloaded.
5. Document and clear your stored parameters.
6. Upgrade the modem's firmware using the .HEX file and the flash upgrade program.
7. Restore your parameters.

Step 1 - Identify the Modem Firmware

You must know the model number and firmware version of your Multi-Tech modem to know whether or not you should update it.

1. Run your favorite terminal program. If you are using Windows, you can use HyperTerminal.
2. In the program's terminal window, type **AT&F**. Even if you cannot see the **AT&F** command on your screen, be sure to type it completely, and then press **ENTER**. If the modem does not respond with **OK**, repeat the **AT&F** command.
3. Now type **ATI3**, press **ENTER**, and record your results. The firmware version should appear first in the response, which should look similar to the following:

```
ACF3_V1.702a_V90_P21_FSH
```

Step 2 - Identify the Current Firmware Version

Identify the current version of the firmware at the Multi-Tech Web site. If your modem already has the current firmware, there is no need to update it.

1. Using your favorite Web browser, go to <http://www.multitech.com/support/MultiModemII/firmware.asp>.
2. Scroll down the table to your modem model number.
3. Look at the firmware version number for your modem.
4. If the firmware version number matches the firmware version number found in “Step 1: Identify the Modem Firmware,” your modem has the current firmware version, and does not need to be updated.
5. If the firmware version number is greater than the firmware version number found in “Step 1: Identify the Modem Firmware,” your modem has an older firmware version. Continue with “Step 3: Download the Upgrade File.”

Warning: The first digit of the new firmware must match the first digit of the old firmware, or the modem may not work properly. E.g., if your current firmware version is 4.16, replace it only with 4.xx firmware, not 6.xx firmware.

Step 3 - Download the Upgrade File

1. If you are not already at the [MultiModemII Firmware page](#) of the Multi-Tech Web site, follow the procedure in “Step 2: Identify the Current Firmware.”
2. Download the upgrade file for your modem by clicking its name, and save the file in a temporary folder on your hard disk.
3. In the same section of the Web page, click the Flash Wizard utility for your operating system to download it, and save it in the same folder.

Step 4 - Extract the Upgrade Files

1. Install the Flash Wizard utility by double-clicking the file name in Windows Explorer.
2. Extract the upgrade files by double-clicking the file name. The extracted files include a .HEX file, which contains the upgrade data, and a Readme file.
3. Copy the upgrade .HEX file into the Flash Wizard folder, which, in a default installation, is at C:\Program Files\MultiTech Systems\Firmware\.

Step 5 - Clear Your Stored Parameters

Before you flash your modem, you should record the parameters that are currently stored in it, so you can reprogram it after flashing. After you have recorded them, send the **AT&F** command to the the modem to clear the stored parameters.

1. Run your favorite terminal program. If you are using Windows 95, Windows 98, Windows NT, or Windows 2000, you can use HyperTerminal.
2. In the program's terminal window, type **AT&V** and press **ENTER** to list your modem's current parameters.
3. Record your parameters by saving the screens and sending them to your printer.
4. Type **AT&F** and press **ENTER** to clear your stored parameters and reset your modem to factory default.
5. Close the terminal program.

Step 6 - Upgrade the Modem's Firmware

Before you begin the following procedure, read the README.TXT file extracted from the upgrade archive file. Note the file name for the boot code (e.g., F35ALOAD.S37) and the file name for the new firmware (e.g., BKQG300G.HEX).

WARNING: Never install an older version of firmware over a newer version. Doing this WILL DESTROY THE FLASH PROM! If the flash PROM is destroyed, the modem must be sent in for repair.

1. Run Flash Wizard by double-clicking its icon or file name, or by selecting it from the Start menu. The **Identifying Devices** dialog box is displayed as Flash Wizard locates and identifies the devices connected to your system.

Note: If the message *ERROR: No valid devices detected* is displayed, verify that the modem is turned on and that all cables are correctly and securely attached.

2. Click the modem to be upgraded, and then click **Next** to proceed.
3. Select the port to be upgraded from the **Port** list, select the appropriate .HEX file from the **Hex File** list, and then click **Next** to continue.

Note: Do not use FLASHLDR.HEX. This file is used internally by Flash Wizard.

4. The **Progress** dialog box appears, showing a status bar that indicates the progress of the upgrade.

Caution: Any disruption of the program during this stage of the upgrade can cause your modem to become inoperable. Wait for the **Next** button to become active before proceeding.

5. When the flash upgrade is complete, the message *Programming Complete* appears. Click **Next** to continue.
6. The **Results** dialog box appears next. Click **Finish** to exit Flash Wizard.

Step 7 - Restore Your Parameters

Your modem has been updated. You can now open your terminal program to reprogram your modem parameters or to confirm the update by typing **ATI3** in the terminal window and pressing **ENTER**.

Appendix E - Installing a Modem Under Linux

Introduction

This appendix explains how to install a modem on a computer operating under the Red Hat Linux 6.2 operating system. Other versions of Red Hat and other Linux operating systems should be similar. Briefly, in Linux, you do not need drivers for most standard external modems and most internal ISA bus modems. Programs in Linux commonly call upon the port, rather than the modem.

Standard Linux Serial Port Definitions

PC port	Linux port
Com1	ttyS0
Com2	ttyS1
Com3	ttyS2
Com4	ttyS3

Installation

Connect the external modem to an available serial port.

Setup

This section describes how to make sure Linux can talk to the modem and be able to dial up to the Internet. Linux can use different programs and desktops depending on who made the Linux operating system and what version it is. The following procedures use the most commonly installed components of Red Hat 6.2. More information can be found in your Linux OS owner's manual.

Using the Terminal Program Minicom to Verify Operation

1. At the command prompt, type **minicom -s** and press ENTER.
2. Select **Serial port setup** and press ENTER.
3. From **Serial port setup**, use the A key to access **Serial Device**, and then press ENTER.
4. Press Esc.
5. You are now in the Minicom terminal. Type **AT** and press ENTER. The screen should display **OK** to verify the operation. Alternately, dial a phone number to verify line operation
6. To leave Minicom, press CTRL + A, and then press Z.
7. On the help menu, press X to exit.

Using the Modem to Call the Internet

Linux allows different graphic user interfaces (GUI). In the following steps, we'll use the Gnome Desktop GUI and assume that the Internet Service Provider (ISP) you are calling assigns you the Domain Name Service (DNS) and Internet Protocol (IP) addresses. For more information on DNS or IP, see the Linux OS owner's manual or contact your ISP.

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.
2. Select **Internet** from the menu.
3. Select **Dialup Configuration Tool**.
4. Select **Add**, and then click **Next**.
5. Enter the connection name and phone number, and then click **Next**.
6. Enter your user name and password, and then click **Next**.
7. Select **Normal ISP** if your ISP is not listed, and then click **Next**.
8. Click **Finish**.

Calling the ISP

1. On the Task Bar at the bottom of the screen, select the Gnome Footprint.
2. Select **Internet** from the menu.
3. Select **RH PPP Dialer**.
4. Select the connection name you entered in step 5 of the previous section.
5. Click **OK**.

Answering Calls

To use the system for answering calls, Linux requires other programs to be installed, such as Mgetty, Mgetty+Sendfax, and others, depending on your requirements. Each vendor of Linux has more than adequate information on installing these programs.

Appendix F - Pin Descriptions

RS-232 Pin Descriptions

Label	Pin	I/O type	Signal name/description
CGND	1	GND	CGND is tied common to GND on the modem's PCB.
TD	2		Transmitted Data The DTE uses the TD line to send data to the modem for transmission over the telephone line or to transmit commands to the modem.
RD	3		Received Data The modem uses the RD line to send data received from the telephone line to the DTE and to send modem responses to the DTE.
RTS	4		Request to Send The RTS signal is used for hardware flow control.
CTS	5		Clear To Send CTS is controlled by the modem to indicate whether or not the modem is ready to transmit data. CTS high indicates to the DTE that signals presented on TD will be transmitted to the telephone line. CTS low indicates to the DTE that it should not transfer data across the interface on TD.
DSR	6	Out	Data Set Ready DSR indicates modem status to the DTE. DSR low indicates that the DTE is to disregard all signals appearing on the interchange circuits except Ring Indicator (RI). It reflects the status of the local data set, and does not indicate an actual link with any remote data equipment.
GND	7	GND	Ground.
CFLO	8	CD	Carrier Detect The modem uses the CD line to signal to the DTE that a carrier has been detected.
+12V	9		A positive voltage output from the modem used for tests or for strapping signals high if needed.
	10		NC
	11		NC
	12		NC
	13		NC
	14		NC
TCLK	15	TC	Transmit Clock Output from modem, used in synchronous mode.
	16		NC
RCLK	17	RC	Receive Clock Output from modem, used in synchronous mode.
V54-2	18	AL	Analog Loop Input to modem to enable analog loop test.
	19		NC
DTR	20	DTR	Data Terminal Ready Input to modem from DTE to control answering and disconnection of modem.

Label	Pin	I/O type	Signal name/description
RDL	21	RDL	Remote Digital Loop Input to modem to enable RDL test.
RI	22		Ring Indicator RI output high indicates the presence of a ring signal on the telephone line.
	23		NC
XCLK	24	XCLK	External Clock Input to modem used in special synchronous applications.
TM	25	TM	Test Mode Output from modem to indicate modem is in one of the test modes.

RS-232 Cable Pinouts

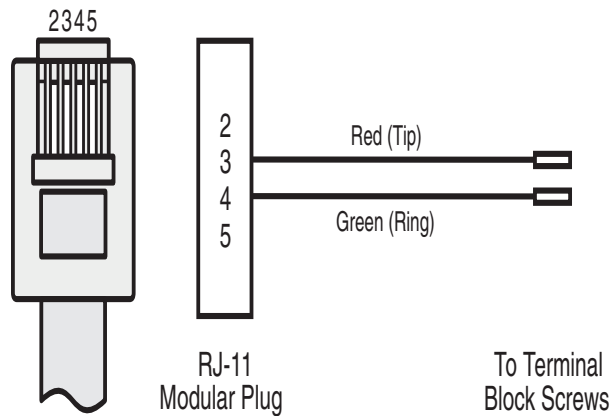


Fig. F-1. 25-pin to 25-pin RS-232 cable.

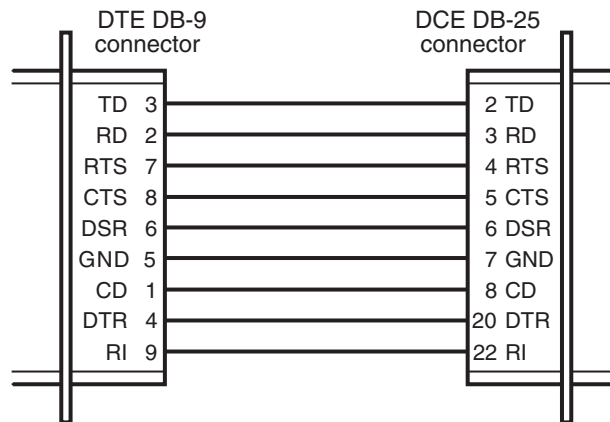


Fig. F-2. 9-pin to 25-pin RS-232 cable.

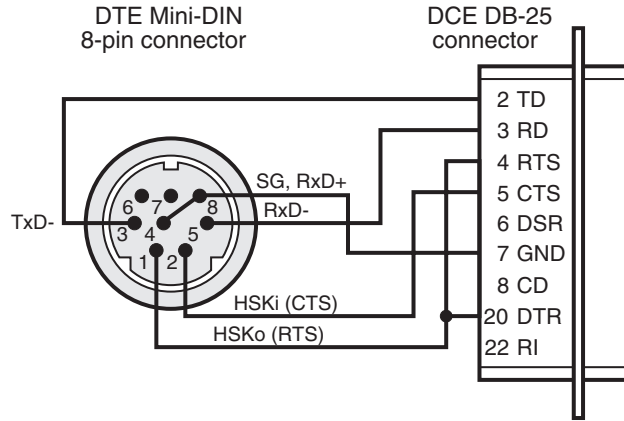


Fig. F-3. Macintosh cable.

Leased Line Pinouts

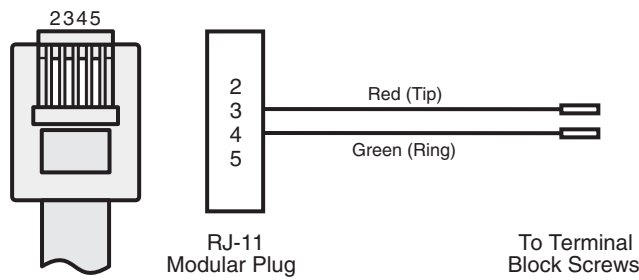


Fig. F-4. Two-wire leased line cable.

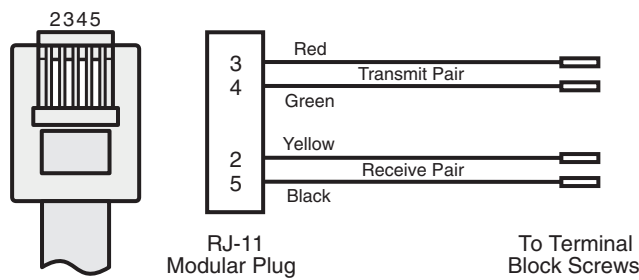


Fig. G-5. Four-wire leased line cable.

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